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# MAINTENANCE MANUAL

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LBI- 3480H

132-174 MHz

**Porta•Mobil**

**Two-Way FM Radio**

MOBILE RADIO DEPARTMENT  
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502



**- TEST REPORT -**  
**CAP**

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EQUIPMENT	MODEL NUMBER	
	SINGLE-FREQUENCY	TWO-FREQUENCY
FM TRANSMITTER		
132-150.8 MHz	4ET62A10	4ET62A11
150.8-174 MHz	4ET62A12	4ET62A13
FM RECEIVER		
132-150.8 MHz	4ER44A10	4ER44A11
150.8-174 MHz	4ER44A12	4ER44A13
1st Oscillator (132-150.8 MHz)	4EG20A10	4EG20A11
1st Oscillator (150.8-174 MHz)	4EG20A12	4EG20A13
CONTROL UNITS		
Standard	4EC60A10	4EC60A12
Extended Control	4EC66A10	4EC66A11
Control Cables		
10-foot		19C303828-G2
20-foot		19C303828-G6
BATTERY POWER SUPPLIES		
Dry Battery Supply	4EP42A10	
Dry Batteries	19B209193-P1	
Rechargeable Battery Supply	4EP65A10	
Rechargeable Battery	19B209138-P3	
3-Rate Charger (supplied with portable combinations)	4EP60A10	
VEHICULAR POWER SUPPLIES		
12-volt DC, $\pm$ ground	4EP47A10	
12-volt DC, - ground	4EP47A11	
Power Cable	19C303640-G3, -G4	
6-volt DC, $\pm$ ground	4EP48A10	
Power Cable	19C303640-G4	
INDUSTRIAL POWER SUPPLY		
24/36-volt DC, ground	4EP52A10	
Power Cable	19B205422, G1 or G2	
TRANSMITTER-RECEIVER CASE		19B204501-G2
MICROPHONE		
Standard	4EM33D10	
Weatherproof	4EM25C10	
Handset	4EM34A10	
CONTROL UNIT MOUNTING KIT (EC-66-A)		19A122010-G2
VEHICULAR MOUNTING FRAME		
Locking	19D402520-G2	
Non-locking	19D402520-G1	
VEHICULAR MOUNTING KIT		19A121826-G1
ALIGNMENT TOOLS		
Hex Slug Type	4033530-G2	
Slotted Screw Type	4038831-P1	
PORTABLE CARRYING STRAP		19C303632-P1
ANTENNA		
Vehicular	4EY12A13	
Portable		
130-150.8 MHz	4EY19C10	
150.8-162 MHz	4EY19C11	
162-166 MHz	4EY19C12	
166-174 MHz	4EY19C13	

### OPTIONAL EQUIPMENT

EQUIPMENT	OPTION NUMBER	MODEL NUMBER
DC Trickle Charge Cable	5502	19B204993-G2
Leather Field Jacket	5503	19D402513-P1
Back Pack	5504	19D402600-G1
Rechargeable Battery Power Supply	5426	4EP65A10
Dry Battery Power Supply	5512	4EP42A10
Vehicle Mounting Frame Non-locking Locking	5506 5501 & 5507	19D402520-G1 19D402520-G2
Vehicle Mounting Kit	5506 & 5507	19A121826-G1
Microphone (Noise Cancelling)	5513	4EM33C10
Battery Power Supply Extension Cable (3-ft.)	5505	19B204289-G1
Channel Guard Encoder	5510	4EH16A10
Selective Calling Decoders	5553 thru 5556	4EJ19A10,11
Antenna (Auto-Gutter Mount)	5982	4EY20A10
Control Cable (20-Foot)	5551	19C303828-G6
Handset	5331 & 5532	4EM34A10
External Battery Charger 117 VAC 3-Rate 117 VAC Timed 23A VAC 3-Rate 234 VAC Timed	5455 5456 5468 5469	4EP60A10 4EP60A11 4EP60A12 4EP60A13
Vehicular Battery Chargers 6-Volt Input 12-Volt Input 24-36 Volt Input	5529 5530 5533	4EP53A10 4EP53A11 4EP53A12

**SPECIFICATIONS \*****GENERAL**

FREQUENCY RANGE	132-174 MHz
SIZE (H x W x L)	9-1/8" x 11" x 3-5/8"
OPERABLE TEMPERATURE RANGE	-30°C (-22°F) to +70°C (+158°F)
BATTERY LIFE	Rechargeable Battery: One 8-hour day (Nickel - Cadmium)
	Dry Battery: Five 8-hour days (Alkaline "D" Cells)

**TRANSMITTER**

MINIMUM RF POWER OUTPUT (13.6 VDC Supply)	8 Watts (132-165 MHz)
	6 Watts (165-174 MHz)
(Dry Battery Supply)	5 Watts (132-174 MHz)
MINIMUM RF POWER OUTPUT (13.6 VDC Supply)	8 Watts (132-165 MHz)
	6 Watts (165-174 MHz)
CRYSTAL MULTIPLICATION	24
SPURIOUS & HARMONICS	At least 53 dB below carrier
FREQUENCY STABILITY	±.0005% (-30°C to +70°C)
MODULATION	±5 kHz
AUDIO RESPONSE	Within +1 dB and -3 dB of a 6 dB/octave pre-emphasis from 300 to 3000 Hz (1000 Hz reference) per EIA standards
AUDIO DISTORTION	Less than 10%
DUTY CYCLE	20% (10% for portable battery life)

**RECEIVER**

SENSITIVITY	
12 dB SINAD	0.3 μV
20 dB Quieting	0.5 μV
SELECTIVITY (EIA)	-80 dB
SPURIOUS RESPONSE	-65 dB
MODULATION ACCEPTANCE	±7 kHz
INTERMODULATION (EIA)	-55 dB
AUDIO CHARACTERISTICS	Within +2 dB and -8 dB of a 6 dB/octave de-emphasis curve from 300 to 3000 Hz (1000 Hz reference) per EIA standards
FREQUENCY STABILITY (First Oscillator)	±.001%
FIRST OSCILLATOR MULTIPLICATION FACTOR	3

**SPECIFICATIONS (CONT'D)**

## AUDIO OUTPUTS

1.5 Watts with less than 10% distortion

10 Watts with less than 10% distortion with optional 10 watt audio amplifier

## SQUELCH SENSITIVITY

0.2  $\mu$ V minimum1.0  $\mu$ V maximum**POWER SUPPLIES**

## INPUTS (TYPICAL)

POWER SUPPLY MODEL	VOLTAGE SOURCE	BATTERY DRAIN (AMPS)		
		Rx Standby	Rx Full Audio	Transmit
4EP42A10	Self contained Dry Battery (19B209193-P1)	0.04	0.30	1.2 (at 22.0 VDC)
4EP65A10	Self contained Nickel-Cadmium Battery (19B209138-P3)	0.04	0.30	3.8 (at 12.5 VDC)
4EP47A10*	$\pm$ 13.8 VDC	0.40	0.65	4.5
4EP47A11	13.8 VDC (Neg Gnd)	0.04	0.30	4.5
4EP48A10	$\pm$ 6.6 VDC	0.70	1.30	11.5 (at 6.5 VDC)
4EP52A10	$\pm$ 36.0 VDC $\pm$ 24.0 VDC	0.26 0.35	0.44 0.60	2.1 2.9

\* If 4EP47A10 is used in negative ground systems, the battery drain is identical to the 4EP47A11.

## OUTPUTS (TYPICAL)

POWER SUPPLY MODEL	POWER OUTPUT		
	Rx Standby	Rx Full Audio	Transmit
4EP42A10	0.03 A	0.30 A	1.2 A (at 22.0 VDC)
4EP65A10	0.03 A	0.30 A	24.0 V @ 0.33 A 32.0 V @ 0.80 A
4EP47A10, A11	13.8 V @ 0.03 A	13.8 V @ 0.30 A	24.0 V @ 0.50 A 32.0 V @ 1.0 A
4EP48A10	13.8 V @ 0.03 A	13.8 V @ 0.30 A	24.0 V @ 0.33 A 32.0 V @ 0.80 A
4EP52A10 ( $\pm$ 36 VDC input)	14.0 V @ 0.067 A	13.7 V @ 0.35 A	24.0 V @ 0.5 A 32.5 V @ 0.97 A
( $\pm$ 24 VDC input)	14.0 V @ 0.067 A	13.6 V @ 0.34 A	23.8 V @ 0.49 A 32.2 V @ 0.97 A

\* These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for complete specifications.



## DESCRIPTION

General Electric PORTA-MOBIL Two-Way FM Radios are high performance, fully transistorized transmitter-receiver combinations providing complete two-way communications for portable, mobile and industrial use.

The PORTA-MOBIL is easily hand-carried by the retractable handle, or it can be carried by means of a shoulder strap -- leaving the hands free. An optional protective leather case and back pack are also available.

The PORTA-MOBIL can be mounted in an optional vehicular mounting bracket for use as a mobile unit. The mounting bracket is designed so that the radio can be quickly and easily removed from the vehicle and used as a portable. An optional lock is available.

The PORTA-MOBIL with Extended Local Control provides a separate weatherproof control unit that can be mounted in any location convenient to the operator. The control contains all operating controls, speaker, microphone and power connections. The control unit is connected to the transmitter-receiver by a 10- or 20-foot cable.

The PORTA-MOBIL is housed in a compact, weatherproof three-section aluminum case that can be quickly disassembled for servicing. All tuning adjustments are easily accessible, and the transmitter and receiver have centralized metering jacks for ease of servicing. For added reliability and reduced maintenance, silicon transistors are utilized throughout the transmitter and receiver.

## OPERATION

### PUSH-TO-TALK SWITCH

Depressing the push-to-talk button on the microphone removes the battery voltage from the receiver, applies power to the transmitter and switches the antenna to the transmitter output. Releasing the push-to-talk button makes the receiver operative again.

### WARNING

Do not touch an uninsulated antenna or the metal ball on an insulated antenna when transmitting, as contact may result in an RF burn.

## VOLUME AND SQUELCH

The VOLUME and SQUELCH controls must be adjusted at the start of operations. The VOLUME control raises or lowers the level of sound heard from the loudspeaker. The SQUELCH control adjusts the signal level required to unmute the receiver.

## AUDIO OUTPUT SWITCH (EC-60-A)

An Audio Output Switch (S702) mounted on the system frame permits the audio output level to be set for either one-watt output (HI) for noisy locations, or for 100-milliwatt output (LO) in quieter locations. Operating with the switch in the LO position reduces the battery drain and increases battery life.

## MAINTENANCE

### PREVENTIVE MAINTENANCE

To insure high operating efficiency and to prevent mechanical and electrical failures from interrupting system operations, routine checks should be made of all mechanical and electrical parts at regular intervals. This preventive maintenance should include the maintenance checks listed on the following page.

### TEST PROCEDURES

Whenever difficult servicing problems occur (such as when the receiver is operating -- but not operating properly), the serviceman should refer to the Test Procedures for the transmitter or receiver. These tests enable the serviceman to compare the actual performance of the transmitter or receiver against the specifications the unit met when shipped from the factory. When the unit is not operating properly, the tests help the serviceman to quickly isolate the defective stage.

Transmitter tests include the following checks:

- Power output
- Tone deviation (for Channel Guard Units)
- Voice deviation

Receiver tests include the following checks:

- Audio output
- 12-dB SINAD (sensitivity)
- Modulation acceptance (IF bandwidth)

MAINTENANCE CHECK	INTERVAL	
	1 Month	As Required
DRY BATTERY SUPPLY - In low usage applications where the dry batteries may last for several months, the batteries should be checked periodically to see if they are leaking electrolyte. If the unit is to be stored for over thirty days, the dry batteries should be removed from the power supply and stored separately in a cool, dry place.	X	
RECHARGEABLE BATTERY SUPPLY - If the rechargeable battery is to be stored for several months or more, it should be "exercised" at regular intervals. Discharge the battery at a rate of 1 to 4 amps to a level of 10 volts (measured with load connected), then fully recharge the battery.	X	
MECHANICAL INSPECTION - Whenever the unit is used in a mobil application, it is subject to constant shock and vibration. Check the unit for loose plugs, nuts, screws and parts to make sure that nothing is working loose.	X	
RELAY CONTACTS - Remove the plug-in relay and examine the contacts. If the contacts are burned or pitted, replace with new relay.		X
ANTENNA - Check to see that the antenna is screwed in tightly. If the antenna should work loose, a loss of radiation or an intermittent signal may result.		X
FREQUENCY CHECK - Check transmitter frequency and deviation as required by FCC. Normally, these checks are made when the unit is first put into operation, after the first six months and once a year thereafter.		X

Test procedures for the transmitter and for the receiver are located on the back of the applicable Alignment Procedure. For best results, the test procedures should be used in conjunction with the Troubleshooting Procedures as explained in the following section.

#### TROUBLESHOOTING PROCEDURES

Some of the problems that may be encountered in servicing the PORTA-MOBIL can be cleared up by means of a close visual inspection for loose connections and loose or burned components. However, when more difficult problems arise, the serviceman should follow the procedures outlined in this section and shown on the applicable drawings in the TROUBLESHOOTING section.

#### Transmitter

The Transmitter Troubleshooting Diagram contains three steps for servicing the transmitter. Step 1 lists some "Quick Checks" for symptoms of poor performance, and the suggested corrective action. Step 2 provides typical and minimum voltage readings of the centralized metering jack as well as DC readings at other stages. Step 3 shows AC voltage readings for the audio stages.

After the defective stage has been isolated the transmitter service sheet may be used to isolate the defective component.

#### NOTE

If it is ever necessary to remove or replace the 2nd driver transistor (Q6), note that the transistor case is at collector potential and the output is coupled by a connection from the heat sink to a tap on collector tank coil L11 (See Transmitter Service Sheet). To insure a good RF connection, as well as proper heat-sinking, it is necessary to tighten the screws on the heatsink as securely as possible without damaging the screws.

#### Receiver

Receiver Troubleshooting Diagram contains four steps for servicing the receiver. Step 1 lists some "Quick Checks" for symptoms indicating poor receiver performance, and the suggested corrective action. Step 2A provides one of the most useful service aids for the receiver, the simplified gain-per-stage measurements. Step 2B shows the proper waveforms for the audio and squelch stages. Step 3 provides the gain-per-stage

measurements.

Refer to the Receiver Service Sheet to find the defective component after the defective stage has been isolated.

#### Power Supplies

The first step in servicing the vehicular or rechargeable power supply is to check the fuses. Then refer to the proper Power Supply Troubleshooting Diagram for a list of "Quick Checks" for symptoms indicat-

ing poor performance, and the suggested action. It also shows the procedure for measuring the battery voltage under transmit conditions. To check individual components refer to the Service Sheet for the applicable Power Supply.

In the dry battery supply, check the fuses and inspect the relay.

For the Model 4EP52A10 Industrial Power Supply, check fuses, then refer to the "Quick Check" on the Service Sheet.

**CIRCUIT ANALYSIS**

NOTE  
The audio section of the transmitter is designed to provide a very high average modulation. Therefore, an operator who is an exceptionally loud talker may cause noticeable distortion in a strong signal area. It may be desirable to reduce speech clip-ping by increasing the value of R23 to 25,000 ohms.

**TRANSMITTER**

General Electric PORTA-MOBIL FM Transmitter Type ET-62-A is a crystal-controlled, frequency-modulated transmitter designed for one- or two-frequency operation within the 132-174 megahertz band. The transmitter consists of the following modules:

- Exciter Board - Audio, oscillator, modulator, multiplier and driver stages (on printed wiring board).
- PA Assembly - Power amplifier and tripler, helical filter FL1/FL3, and low-pass filter FL2.

The range and number of frequencies for each transmitter model is shown in the following chart:

MODEL	FREQUENCY RANGE	NO. OF FREQUENCIES
4ET62A10	132-150.8 MHz	One-Frequency
4ET62A11	132-150.8 MHz	Two-Frequency
4ET62A12	150.8-174 MHz	One-Frequency
4ET62A13	150.8-174 MHz	Two-Frequency

The transmitter uses a total of 12 transistors and 6 diodes to provide a minimum power output of 8 watts (132-165 MHz) and 6 watts (165-174 MHz) when used with the high power rechargeable battery supply or vehicular power supplies. A power output of 5 watts is obtained with the dry battery supply. The crystals used fall in a range of 5.42 to 7.25 megahertz, and the crystal frequency is multiplied 24 times.

Centralized metering jack J11 is provided for use with General Electric Test Set Model 4EX3A10, for ease of alignment and maintenance. The Test Set meters the phase modulator, multiplier, driver and PA stages as well as RF power output, B-plus and regulated supply voltages.

**POWER INPUTS**

The high power rechargeable supply and the vehicular power supplies provide 22 volts for the doubler, multiplier and driver stages, and 32 volts B-plus for the PA stage. The medium power dry battery supply provides 22 volts to the transmitter and PA stage.

A regulated 13.5 volts is used for the oscillator, modulator and audio stages.

**VOLTAGE REGULATOR**

A shunt-type voltage regulator circuit consisting of regulator transistor Q11, zener

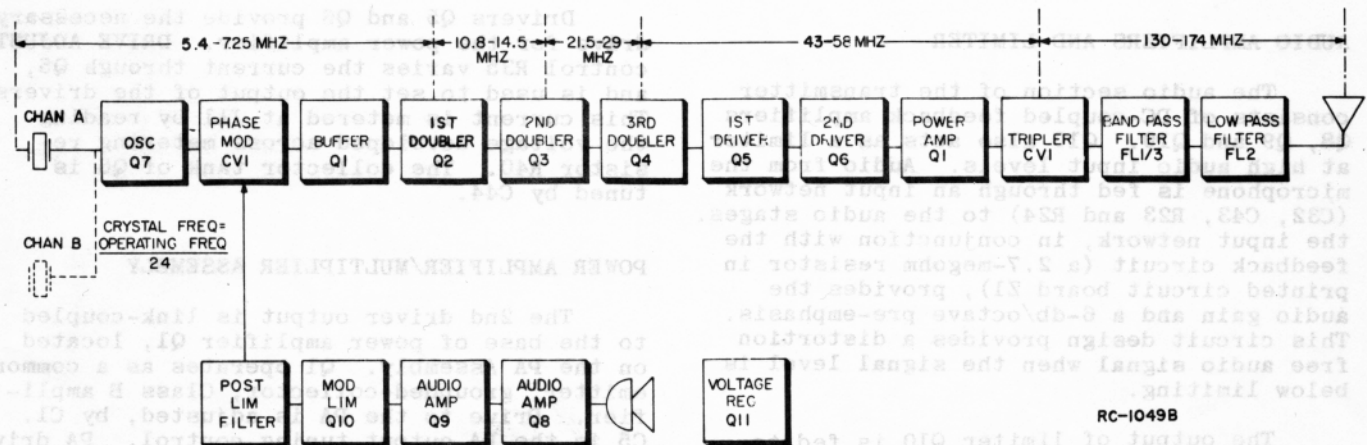


Figure 1 - Transmitter Block Diagram



diode CR4 and light bulb RT5 maintains a regulated 13.5-volt supply. The diode establishes a 13.5-volt reference level for the base of Q11. When the voltage starts to rise above this level, the base bias on Q11 increases, causing the transistor to conduct more heavily. This draws more current through the light bulb. With more current flowing, less voltage appears at the output. This keeps the output voltage from going beyond the 13.5-volt reference level.

When the voltage starts to drop below 13.5 volts, the base bias on Q11 decreases, and Q11 conducts less. With less current flowing in the circuit, the voltage increases. This keeps the output voltage at 13.5 volts.

R29 is a metering resistor for centralized metering jack J11.

#### OSCILLATOR

A crystal-controlled Colpitts type oscillator is used in the transmitter. The oscillator is thermistor-compensated at both ends of the temperature range and provides a frequency stability of .0005% without crystal ovens or warmers. Feedback for the oscillator is developed across C35. The oscillator frequency is adjusted by trimmer C24. In the single-frequency transmitter, the regulated 13.5 volts is applied to the oscillator circuit (through J1) only while the transmitter is being keyed. The oscillator output is coupled through impedance step-down capacitors C28 and C29 to phase modulator CV1.

In the two-frequency transmitter, a second oscillator circuit identical to the Frequency 1 oscillator is added except that R26 is replaced by diode CR3, and only a single oscillator transistor is used. For two-frequency operation, the crystals are switched by means of diode biasing.

#### AUDIO AMPLIFIERS AND LIMITER

The audio section of the transmitter consists of DC-coupled feedback amplifiers Q8, Q9 and Q10. Q10 also acts as a limiter at high audio input levels. Audio from the microphone is fed through an input network (C32, C43, R23 and R24) to the audio stages. The input network, in conjunction with the feedback circuit (a 2.7-megohm resistor in printed circuit board Z1), provides the audio gain and a 6-db/octave pre-emphasis. This circuit design provides a distortion free audio signal when the signal level is below limiting.

The output of limiter Q10 is fed to printed circuit board Z2 which provides a 6-db/octave de-emphasis. MODULATION ADJUST potentiometer R31 determines the maximum signal level applied to modulator CV1.

#### NOTE

The audio section of the transmitter is designed to provide a very high average modulation. Therefore, an operator who is an exceptionally loud talker may cause noticeable distortion. In a strong signal area, it may be desirable to reduce speech clipping by increasing the value of R23 to 22,000 ohms.

#### PHASE MODULATOR

Phase modulator CV1 is a voltage-variable capacitor (varactor) operating in series with tuneable coil L1. The modulator operates with a reverse bias of 7-1/2 volts. CV1, in series with L1, appears as a series-resonant circuit to the RF output of the oscillator. An audio signal applied to the modulator shifts the capacitance of CV1 about the 7-1/2-volt level. This variation in capacitance causes the output of the circuit to be frequency modulated. The modulator output is coupled through blocking capacitor C2 to the base of buffer Q1.

#### BUFFER AND DOUBLERS

Buffer Q1 isolates the modulator from the loading effects of the first doubler and provides some amplification. The buffer also clips off any AM appearing in the modulator output. The buffer output is resistance-coupled to the doubler.

Following the buffer stage are three self-biased, Class C doubler stages (Q2, Q3, and Q4). The doublers multiply the crystal frequency eight times. Metering resistors R37, R38 and R39 are for metering the multiplier stages at J11.

#### DRIVERS

Drivers Q5 and Q6 provide the necessary drive for the power amplifier. DRIVE ADJUST control R35 varies the current through Q5, and is used to set the output of the drivers. This current is metered at J11 by reading the voltage developed across metering resistor R40. The collector tank of Q6 is tuned by C44.

#### POWER AMPLIFIER/MULTIPLIER ASSEMBLY

The 2nd driver output is link-coupled to the base of power amplifier Q1, located on the PA Assembly. Q1 operates as a common-emitter, grounded-collector, Class B amplifier. Drive to the PA is adjusted, by C1. C5 is the PA output tuning control. PA drive is metered at J11.

RF from the PA is coupled through a pi-filter (C14, L2 and C5) to a passive tripler.

The tripler consists of three tuned circuits --L3 and C6, L4 and C7, L5 and C8, which are coupled together through varactor CV1. The first tuned circuit (L3-C6) is tuned to approximately 43 to 58 megahertz. The second circuit (L4-C7) is tuned to the second harmonic of the input signal, and the third circuit (L5-C8) is tuned to the third harmonic (or operating frequency).

When the PA output is applied to the circuit, varactor CV1 severely distorts the input signal, providing a signal with a large third harmonic content. This third harmonic is fed from the third tuned circuit (L5-C8) to helical filter assembly FL1/FL3. An RF "sniffer" circuit (CR1 and R2) detects a small portion of the tripler output so that the relative power output can be metered at J11.

**HELICAL FILTER (FL1/FL3)**

The PA/tripler output is rich in undesirable harmonics. Therefore, the output is fed to a helical filter (FL1-150.8 to 174 MHz, FL3-130 to 150.8 MHz) to select only the third harmonic from the tripler.

**LOW-PASS FILTER (FL2)**

Following FL1/FL3 is a low-pass filter (FL2) which further attenuates any harmonics in the transmitter output. A second RF "sniffer" circuit (CR1 and R1) is provided for tuning the helical filter (FL1/FL3) to obtain maximum output to the antenna. The RF output of the transmitter is then fed to the push-to-talk relay in the control unit.

**RECEIVER**

The PORTA-MOBIL Receiver Type ER-44-A is a double-conversion, superheterodyne receiver designed to operate on fixed frequencies within the 132 to 174 megahertz band.

The receiver consists of Receiver Board PL-19D402257-G1 and the 1st oscillator board. The frequency ranges and number of

frequencies for the receiver and 1st oscillator are shown in the chart elsewhere on this page.

The audio PA stage and loudspeaker are located in the control unit. The unit is completely transistorized--utilizing 17 silicon transistors seven silicon diodes and two zener diodes. An additional transistor is added for two-frequency operation.

A centralized metering jack (J312) is provided for use with General Electric Test Set Model 4EX3A10 for aligning and servicing the receiver. The Test Set meters the limiter stages, oscillator, supply voltages, voice coil, PA and discriminator stages.

**VOLTAGE REGULATOR**

The receiver operates on a regulated 10 volts provided by Q315 and Q316 in a series regulator circuit.

When the input voltage at J302 tries to rise, the output voltage at the emitter of Q315 also tries to rise. This changes the base-emitter bias on Q316, causing it to conduct more heavily. When Q316 conducts, there is less base bias on Q315 and, therefore, less base current flows through the transistor. With less base current flowing, the voltage drop across Q315 is larger and less voltage appears at the output.

When the input voltage starts to drop, Q316 conducts less, increasing the forward bias on Q315. The increased forward bias decreases the voltage drop across Q315, and more voltage appears at the output. Regulation will stop if the input value drops below 11 volts.

R372, (10-volt REGULATOR adjustment) is set for a 10-volt reading at centralized metering jack J312 when aligning the receiver.

**RF AMPLIFIER**

RF signals from the antenna are fed to the base of low noise RF amplifier Q301

RECEIVER MODEL NO.	RECEIVER BOARD	1ST OSCILLATOR BOARD	FREQUENCY RANGE	NUMBER OF FREQUENCIES
4ER44A10	PL-19D402257-G1	4EG20A10	132-150.8 MHz	One-Frequency
4ER44A11	PL-19D402257-G1	4EG20A11	132-150.8 MHz	Two-Frequency
4ER44A12	PL-19D402257-G1	4EG20A12	150.8-174 MHz	One-Frequency
4ER44A13	PL-19D402257-G1	4EG20A13	150.8-174 MHz	Two-Frequency

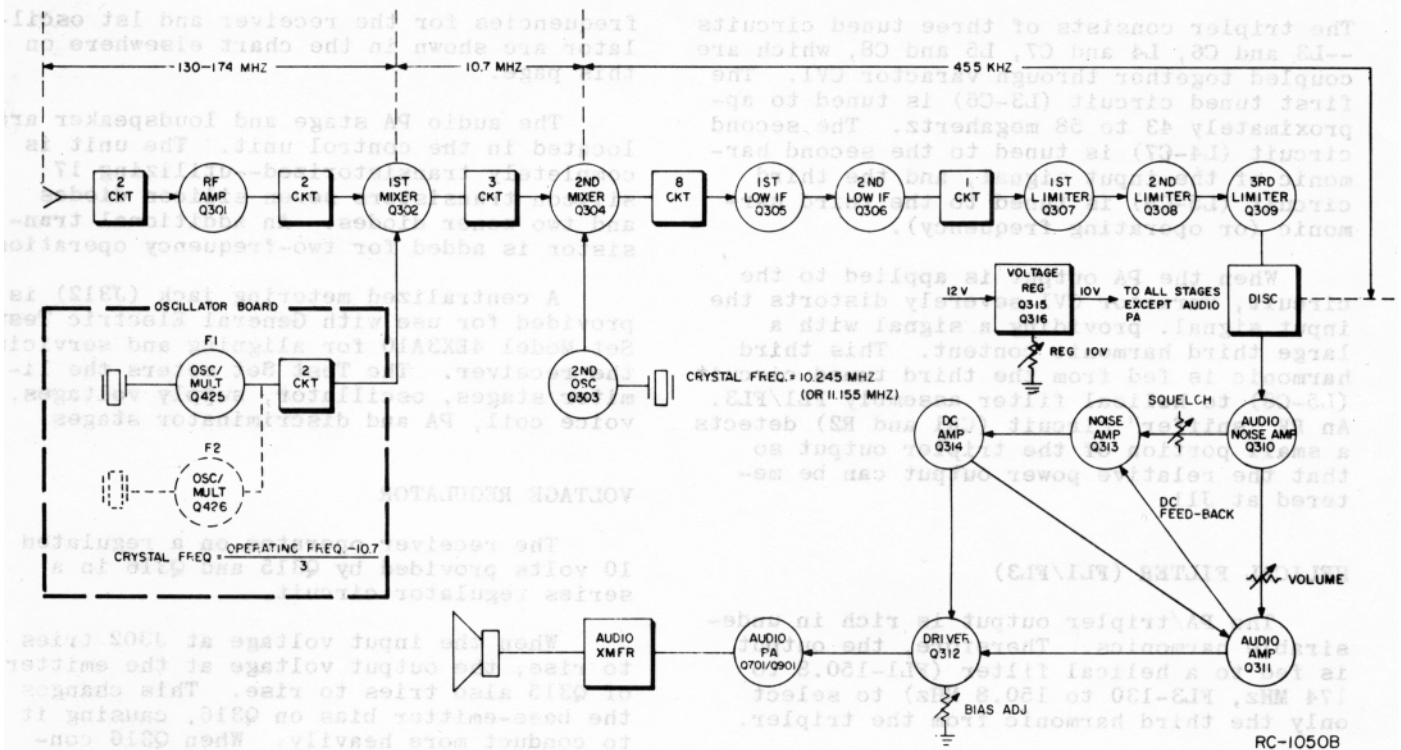


Figure 2 - Receiver Block Diagram

through two tuned pre-selector circuits. The output of the RF amplifier is inductively coupled through two tuned circuits to the base of the 1st mixer.

#### OSCILLATOR/MULTIPLIER

Q425 is a third mode oscillator that operates in the 39 to 54 megahertz region. The crystal is connected in the oscillator feed-back path to permit oscillation only at the crystal frequency. L425, C425, C426 and C428 make up the mode selective resonant circuit. Adjustable coil L425 permits the oscillator frequency to be shifted slightly for setting the receiver on the system operating frequency. The collector tank of Q425 is tuned to three times the crystal frequency.

For two-frequency operation, a second oscillator/multiplier stage is added. Channels are selected by gounding the emitter of the desired oscillator by means of a two-frequency switch on the control unit.

#### 1ST MIXER

RF signals from the RF amplifier are fed to the base of 1st mixer Q302 along with the oscillator injection frequency (operating frequency minus 10.7 MHz). The 10.7 megahertz Hi IF mixer output is fed to a three-coil torroidal Hi IF filter and then fed to the base of 2nd mixer Q303.

#### 2ND OSCILLATOR AND MIXER

Q303 operates as a Pierce oscillator with a crystal frequency of 10.245 (or 11.155) megahertz.

Hi IF from the 1st mixer is applied to the base of 2nd mixer Q304. This Hi IF is mixed with the 2nd oscillator low side (or high side) injection frequency which produces the 455-kilohertz Low IF. The main receiver selectivity is provided by the eight-coil Low IF filter following the 2nd mixer.

#### LO IF AMPLIFIERS

Two RC-coupled Low IF amplifiers (Q305 and Q306) are used to amplify the signal going to the limiter stages. The amplifier output is coupled to the 1st limiter through a 455-kHz filter (L316 and C348) which reduces the noise bandwidth of the IF string.

#### LIMITERS

Following the Low IF amplifier are three RC-coupled limiter stages, Q307, Q308 and Q309, which operate as over-driven amplifiers. The 1st and 2nd limiter stages are metered at the centralized metering jack (J312) through metering diodes CR301 and CR302.



**DISCRIMINATOR**

The limiter output is applied to the Foster-Seely type discriminator, where the audio voltages are recovered from the 455-kHz Low IF. A Low IF filter, made up of C364, C365, C366, R342 and R344, removes any 455-kHz signal remaining in the discriminator output.

**AUDIO AMPLIFIERS**

When audio is present in the incoming signal, it is fed to the base of audio-noise amplifier Q310. Following Q310 is an audio de-emphasis network consisting of C368, C369, C370, R347, R349 and R350.

After the de-emphasis network, audio is fed to the base of audio amplifier Q311 through the volume control mounted on the control unit. The VOLUME control sets the amount of drive to the audio stages. An audio driver (Q312) and an audio output stage (Q701 in the EC-60-A Control Unit or Q901 in the Transmitter-Receiver top covers when the EC-66-A Control Unit is used) follow audio amplifier Q311. Audio Bias trimmer R366 sets the bias on Q312 and Q701, and is adjusted for a 250-millivolt reading at metering jack J312. The output of Q701/Q901 drives the loudspeaker.

**SQUELCH**

Noise from audio-noise amplifier Q310 is used to operate the squelch circuit. When no carrier is present in the receiver, this noise is coupled through a noise filter (which attenuates any audio frequencies) to the base of noise amplifier Q313. The noise filter consists of C377, C378, C385 and L319. The noise level fed to the noise amplifier is set by the SQUELCH control, located on the control unit. The output of noise amplifier Q313 is rectified by diodes CR305 and CR306, and filtered by C382 and C383 to produce a positive DC voltage. This DC voltage turns on the DC amplifier (Q314), causing it to conduct. When conducting, the collector voltage of the DC amplifier drops to ground potential, which removes the bias on the audio stages and turns them off.

When audio amplifier Q311 is being turned off, its emitter potential decreases. This results in a positive DC feedback through R351 to the emitter of noise amplifier Q313 which causes an increase in the gain. As the gain of Q313 increases, the positive DC voltage to the DC amplifier increases, turning the audio stages off quickly.

When the receiver is quieted by a signal, less noise is present in the circuit and DC amplifier Q314 stays off. The audio stages are allowed to conduct and audio is heard from the speaker. With audio amplifier Q311 conducting, positive voltage

appears across R351 which helps reduce the gain of noise amplifier Q313. The positive feedback causes a quick, positive switching action in the squelch circuit.

**POWER SUPPLIES**

Two battery, one industrial and three vehicular power supplies are available for use with PORTA-MOBIL and are interchangeable if proper power cables are used.

The high power rechargeable battery supply Model 4EP65A10 and the medium power dry battery supply Model 4EP42A10 fit into drawn aluminum cans that attach to the bottom of the portable case.

The vehicular power supply models 4EP47A10 (12-volt,  $\pm$  ground), 4EP47A11 (12-volt, - ground only), 4EP48A10 (6-volt,  $\pm$  ground) and industrial power supply Model 4EP52A10 (24/36 volt,  $\pm$  ground) fit into an aluminum casting that serves as a heat sink for the power transistors. The casting attaches to the bottom of the case. Power connections are made by a two-wire cable terminated at one end by a three-pin connector which plugs into the power supply. (For Extended Local Control, the power source is connected to the red and brown wires extending out of the control cable when used with 6/12 volt power supplies). The other end of the cable is terminated by ring terminal lugs which connect to the power source.

To obtain optimum power output-to-battery life when changing to the dry battery, the transmitter should be retuned each time power supplies are interchanged.

All power connections to the transmitter and receiver are made through a jack on the power supply case that connects to a plug on the transmitter-receiver section.

**MULTIVIBRATOR CIRCUIT - (All Models Except Dry Battery and Industrial)**

The receiver operates on 12 volts directly from BT501. Keying the transmitter switches the receiver supply to the multivibrator circuit. The transistors act as switches, with one conducting while the other is off. The multivibrator circuit is essentially a square wave generator, whose output is stepped up by a power transformer, then rectified and filtered to provide two supply voltages for the transmitter; 24 volts for the multiplier and driver stages and 32 volts for the PA stages.



The base bias divider network consists of an incandescent lamp and a resistor. When power is applied to the circuit, the cold filament of the lamp presents a very low resistance. This establishes a heavy forward bias for cold starting. Immediately upon starting, the lamp filament warms up and increases in resistance to provide normal running bias for the transistors. Due to inherent differences in the transistors, one will start conducting before the other and will draw a heavier current through one-half of the primary windings of T501.

Assume that Q501 starts to conduct first, causing a current to flow through one-half of the primary winding. This current flow induces a voltage in all windings of the transformer. A negative voltage is induced in the feedback windings, providing more forward bias to Q501, and causing it to conduct more heavily. The positive voltage appearing at one end of the feedback winding acts to cut off Q502.

The current through the primary winding rapidly saturates the core of the transformer, which stops the magnetic field (flux) from increasing. With no change in the magnetic field, no voltages are induced in the windings. The magnetic field starts to collapse, sending a current through transformer in the opposite direction.

This reverses the polarity of the induced voltage in the windings, which cuts off Q501 and provides a forward bias to Q502, causing it to conduct. The frequency of the multivibrator is approximately 5,000 hertz.

**BATTERY SUPPLIES**

**RECHARGEABLE BATTERY SUPPLY**

Rechargeable Power Supply Model 4EP65A10 employs a 12-volt nickel-cadmium battery in conjunction with a multivibrator circuit to supply all voltages for the portable. The power supply will operate the portable unit for one 8-hour day at the rated duty cycle. The battery is considered to be discharged when the battery voltage measures 10 volts with the transmitter keyed. Damage to the battery may result if it is discharged below the 10-volt level.

A Three-Rate External Charger Model 4EP60A10 that operates from 117 VAC is available for use with the Rechargeable Battery Power Supply. The charger connects to the recessed 5-pin plug (J503) on one end of the power supply. Other chargers are available for operation on AC or DC as indicated in the Optional Equipment Index. All chargers are capable of delivering 100% recharge to the battery. CR513 prevents discharge of the rechargeable bat-

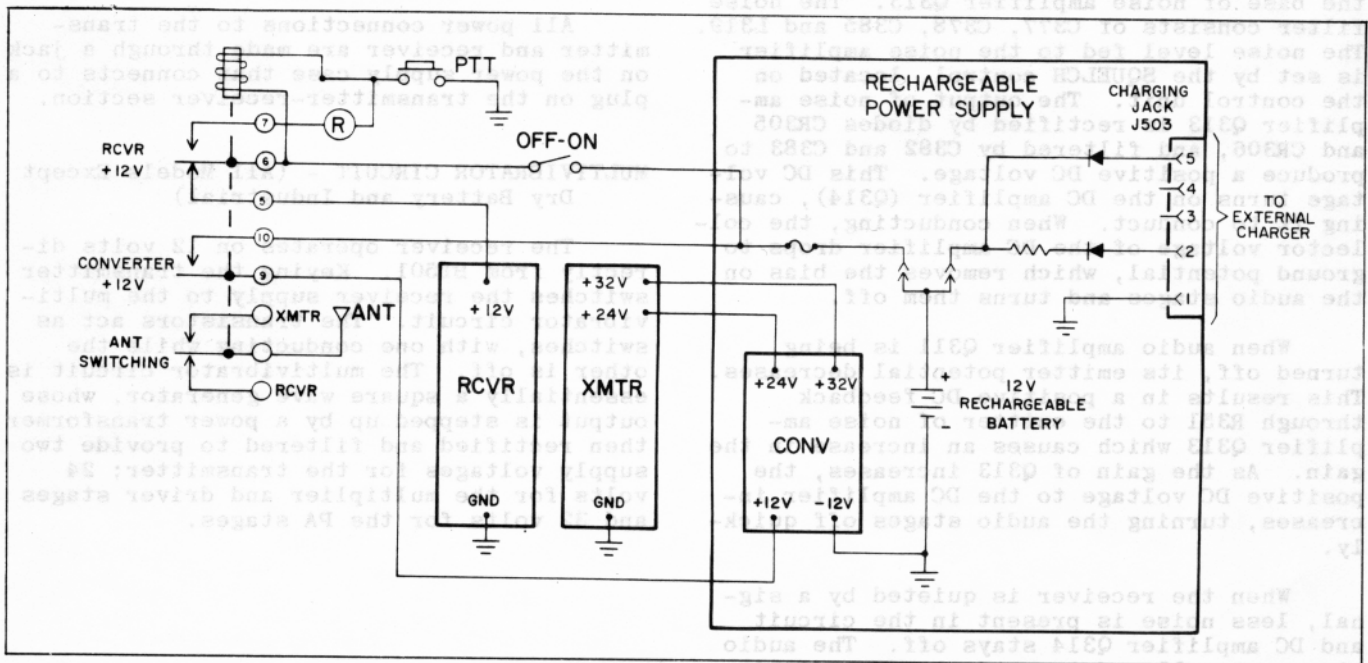


Figure 3 - Antenna Switching and Power Distribution for Rechargeable Battery Supply

tery through a charger that has been turned off but left connected to J503.

In addition, a DC Charging Cable is available for operation from a negative ground vehicle system only. The cable is used to provide a trickle charge to the battery. When the optional DC charging cable is used, the vehicle battery voltage appears across pin 1 (GND) and pin 2 (HOT) of charging jack J503. The voltage from pin 2 is fed through diode CR511 and then through current limiting resistors R503 and R504 to rechargeable battery BT501. CR511 prevents BT501 from discharging into the vehicle battery and also protects BT501 if the charger cable is inadvertently connected to a positive ground system.

**DRY BATTERY SUPPLY (Figure 4)**

Dry Battery Power Supply Model 4EP42A10 uses sixteen 1-1/2 volt "D" cells to provide transmitter and receiver supply voltages.

The dry batteries in the power supply are arranged into four sections that are connected to form two 12-volt banks. The first 12-volt bank consists of batteries BT501 through BT508, while the second bank consists of BT509 through BT516. The two banks operate in parallel to provide the 12-volt receiver supply.

Keying the transmitter energizes battery switching relay K501, which connects the two battery banks in series for the 24-volt transmitter and PA supply. When the microphone button is released, the batteries switch back to parallel operation for the receiver supply.

Diode CR501 prevents the transmitter from keying if the batteries are inserted into the power supply incorrectly (polarity reversed). Figure 4 is the antenna switching and power distribution diagram for the dry battery supply.

**VEHICULAR POWER SUPPLIES**

MODEL 4EP47A10 (12 VOLT ± GROUND) (Figure 5)

For positive ground operation, the pilot relay (K501) is controlled by the ON/OFF switch on the Control Unit and the power supply run continuously to supply receiver voltage. The PTT (Push-To-Talk) controlled relay in the Control Unit keys a secondary relay (K503) to provide transmitter voltage.

For negative ground operation, the secondary relay is made nonoperative and the pilot relay is keyed by the PTT-controlled relay in the Control Unit. Receiver voltage is supplied directly from the vehicle battery.

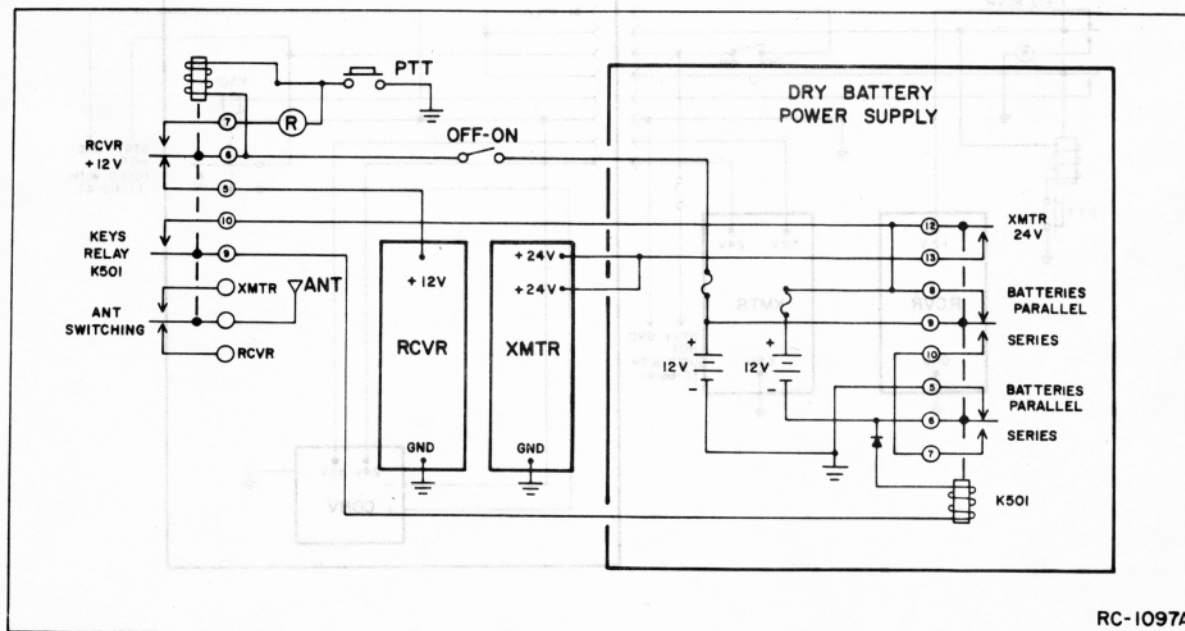


Figure 4 - Antenna Switching and Power Distribution for Dry Battery Supply

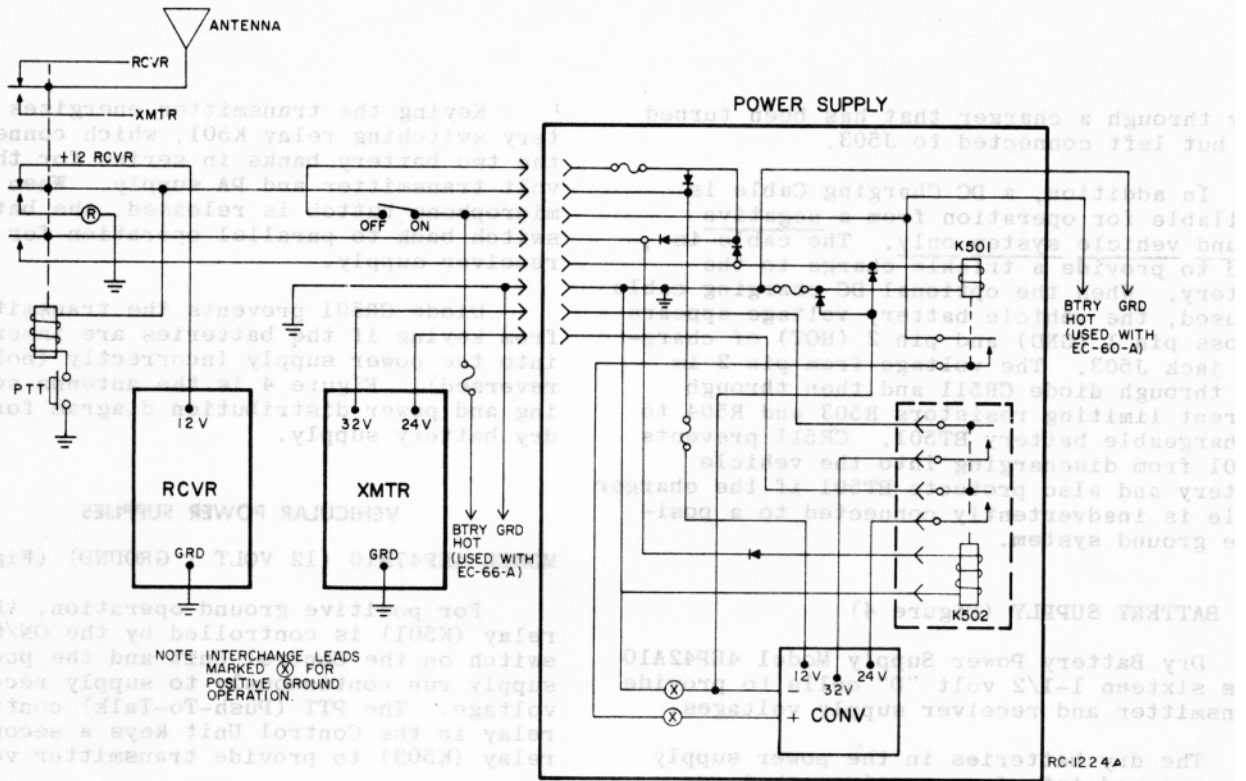


Figure 5 - Antenna Switching and Power Distribution for Model 4EP47A10

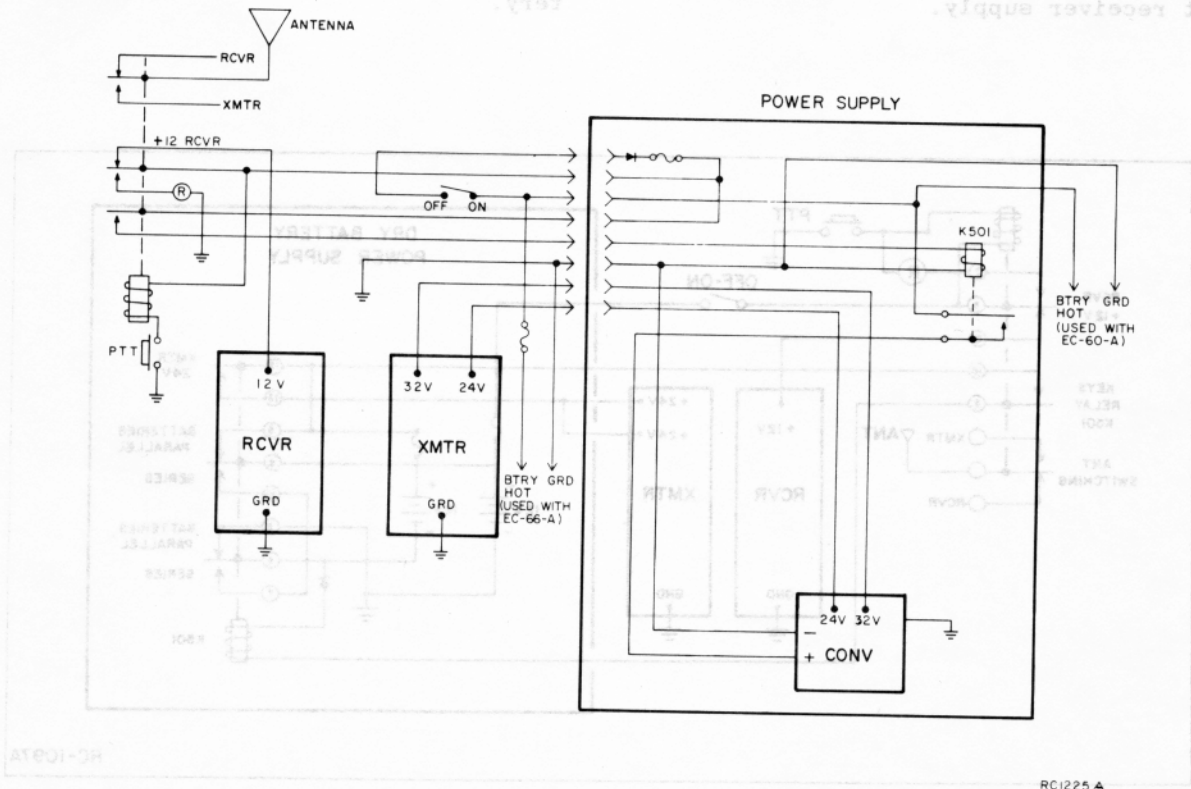


Figure 6 - Antenna Switching and Power Distribution for Model 4EP47A11

NOTE

Power Supply Models 4EP47A10 and 4EP48A10 are shipped from the factory wired for negative ground vehicle systems. For positive ground systems, make sure that the changes shown on the top cover of the power supply have been made.

These changes include:

- For Model 4EP47A10 — Switch S501 to the POSITIVE GROUND position, and reverse the red and green leads at TB6.
- For Model 4EP48A10 — Reverse the red and green leads at TB6.
- For optional 10-Watt Audio amplifier 19B205165-G1 — Reverse one pair of black-white and red-white leads at TB2-3 and -4.

MODEL 4EP47A11 (12-VOLT NEGATIVE GROUND)  
(Figure 6)

This power supply can be used only with negative ground systems. The pilot relay is keyed by the PTT-controlled relay in the Control Unit. Receiver voltage is supplied directly from the vehicle battery.

MODEL 4EP48A10 (6-VOLT ± GROUND) (Figure 7)

The pilot relay (K504) is controlled by the ON/OFF switch on the Control Unit for either positive ground or negative ground systems. With the switch ON, the power supply runs continuously as it supplies receiver voltage.

REGULATOR CIRCUIT

The power supply output is regulated by controlling feedback to the switching transistors. Q503 is controlled by the rectified output from control winding S2, F2 and diode CR501/CR515. The ratio of winding S2, T2, F2 to winding S3, T3, F3 is adjusted to furnish just sufficient breakdown voltage for CR501/CR515 at a minimum input voltage and maximum expected load on the secondary windings. Q503 bias will be moving toward cutoff for all higher input voltages.

When input voltages increases, the voltage appearing across R504 increases, increasing the current through CR501/CR515 and driving Q503 further into cutoff. This

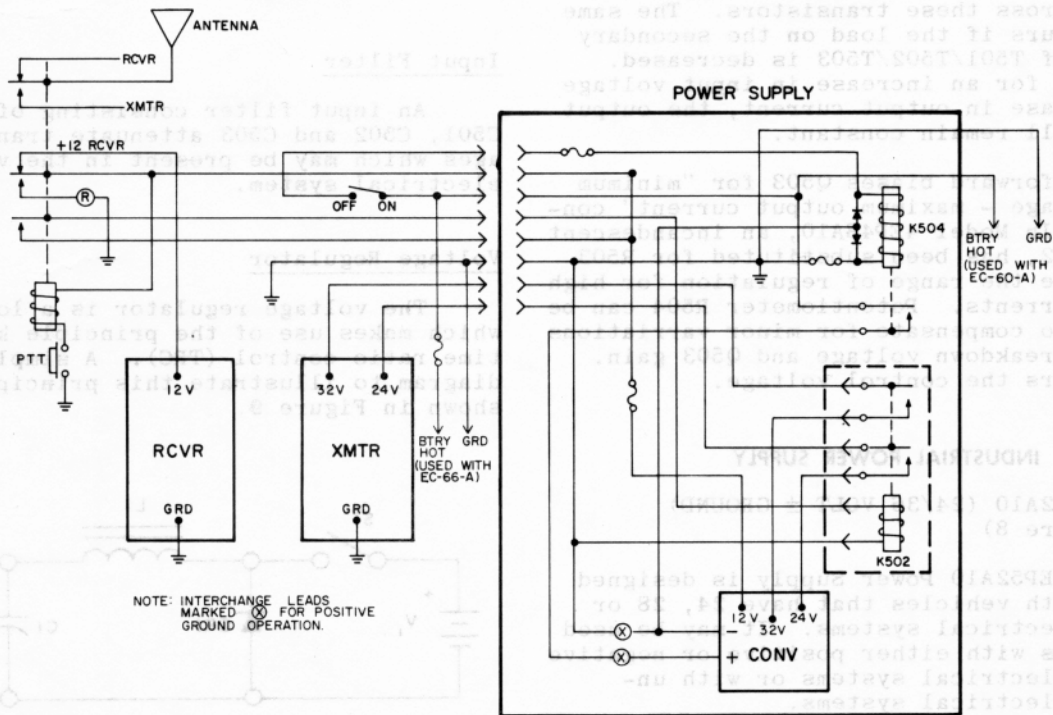


Figure 7 - Antenna Switching and Power Distribution for Model 4EP48A10



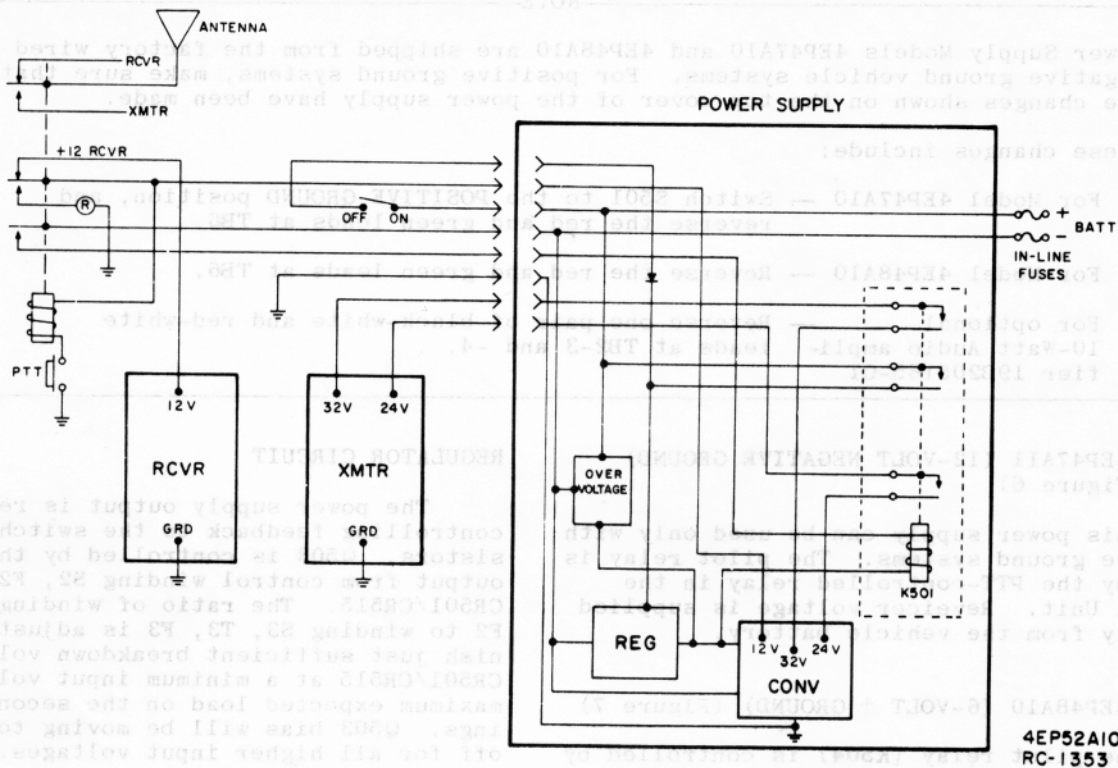


Figure 8 - Antenna Switching and Power Distribution for Model 4EP52A10

results in a decrease in base current to Q501 and Q502 and the excess voltage is dropped across these transistors. The same action occurs if the load on the secondary windings of T501/T502/T503 is decreased. Therefore, for an increase in input voltage or a decrease in output current, the output voltage will remain constant.

R503 forward biases Q503 for "minimum input voltage - maximum output current" conditions. In Model 4EP48A10, an incandescent lamp, DS502, has been substituted for R503 to increase the range of regulation for high primary currents. Potentiometer R504 can be adjusted to compensate for minor variations in zener breakdown voltage and Q503 gain. C504 filters the control voltage.

**INDUSTRIAL POWER SUPPLY**

MODEL 4EP52A10 (24/36 VOLT ± GROUND)  
(Figure 8)

The 4EP52A10 Power Supply is designed for use with vehicles that have 24, 28 or 36 volt electrical systems. It may be used in vehicles with either positive or negative grounded electrical systems or with ungrounded electrical systems.

The power supply consists of an input filter, voltage regulator, voltage protective network and a DC to DC converter. Outputs of 12, 24 and 32 volts are provided for op-

erating the PORTA-MOBIL transmitter and receiver.

Input Filter

An input filter consisting of L501, L502, C501, C502 and C503 attenuate transient voltages which may be present in the vehicle electrical system.

Voltage Regulator

The voltage regulator is a low-loss type which makes use of the principle known as time ratio control (TRC). A simplified diagram to illustrate this principle is shown in Figure 9.

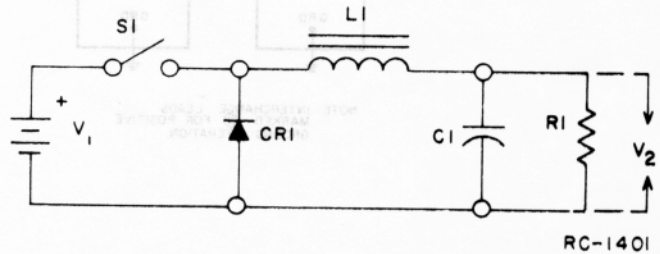


Figure 9 - Simplified TRC Circuit

In this circuit the operation of S1 will cause an output voltage (V2) to appear across the load. If the switch (S1) is closed indefinitely, the output voltage will equal the input voltage (V1). If the switch is opened indefinitely, the output voltage will equal zero. The switch must be operated periodically to obtain an output voltage between V1 and zero. By changing the duty cycle (ON-OFF cycle) of the switch, the output voltage can be closely controlled.

In actual application, S1 is replaced by a transistor switch Q501. Associated timer (relaxation oscillator), driver and error detection circuits automatically regulate the switching rate and ON-OFF duty cycle of Q501 to supply the proper output voltage (approximately 20 volts) to the converter from a wide range of battery voltages.

During power supply operation, relaxation oscillator Q507 supplies a 2500 Hz saw-tooth output to the base of Q502 causing Q502 to conduct. Operation of Q502 causes Q503 to conduct and turn on transistor switch Q501. The period of time that Q502 conducts during each saw-tooth pulse, and the resultant output from the regulator circuit, is determined by error detection circuits of VR501 and Q506 which regulate the base bias of Q502.

When the regulator output voltage increases and the voltage at the tap of R508 exceeds the breakdown voltage of VR501, Q506 will conduct. This decreases the base bias of Q502, causing it to conduct for a shorter period during each saw-tooth pulse. As a result, transistor switch Q501 is on for a shorter portion of each duty cycle and the regulator output will decrease to be the desired level.

If the battery voltage drops below the normal setting of the regulator output, VR501 no longer conducts and Q506 is turned off. In this case the bias of the base of Q502 is sufficient to permit Q502 to conduct for the full period of the saw-tooth pulse. This permits transistor switch Q501 to remain on continuously providing maximum output from the regulator.

#### DC to DC Converter

The regulator output is applied to the emitters of Q504 and Q505 which form a conventional inductively coupled converter with transformer T501. Q504 and Q505 act as switches, with one conducting while the other is off. Due to the inherent differences in the transistors, one will start conducting before the other when power is applied to their emitters.

Assume that Q504 starts to conduct first, causing current to flow through one half of the primary winding of T501. The induced voltage in the feedback winding of T501 is coupled to the base of Q504 further increasing collector current. Regenerative

action continues until the primary of T501 is saturated. When saturation is reached, there is no increase of collector current and no voltage is induced in the feedback winding. The magnetic field starts to collapse, sending a current through the transformer in the opposite direction. This reverses the polarity of the induced voltage in the feedback winding which cuts off Q504 and provides a forward bias for Q505 causing it to conduct. The two transistors continue to conduct alternately at a frequency of approximately 2000 hertz.

The secondary windings of T501 provide outputs for the 12, 24, and 32 volt rectifier and filter circuits.

#### Over Voltage Protective Circuit

The over-voltage circuit protects the converter and transmitter-receiver from damage caused by a regulator failure of improper setting of R508. The surge is applied through an over-voltage circuit (VR502, Q508, and SCR501) and will blow one or both line fuses.

#### Adjustment of R508 and R513

Potentiometers R508 are pre-set at the factory and should be adjusted only under the following conditions.

1. If zener diode VR501 is replaced, check for 24 volts at J501-1 with the transmitter keyed. Vary R508 if necessary to obtain this voltage.
2. If Q507 is replaced, check for a 400-microsecond duration saw-tooth waveform across C505. Adjust R513 if necessary to obtain this waveform.

#### NOTE

If optional 10-watt audio amplifier (for 24/36 volt systems) is used, the external power source must be 24/36 volts as specified on the combination nameplate.

#### CONTROL UNITS

Type EC-60-A or EC-66-A Control Units are used with the PORTA-MOBIL.

Control Unit EC-60-A consists of a cast aluminum control head assembled to the system frame. All operating controls as well as the antenna and microphone jacks, carrying handle, audio output stage, weatherproof speaker and plug-in system relay are mounted on the control head. The audio output switch (S702) and the eight-pin power connection are mounted on the system frame. The transmitter and receiver printed wiring boards mount within the frame.

The following chart lists the Control Unit Model numbers and Options:

MODEL	NO. OF FREQS.	OPTION	MICROPHONE
4EC60A10	One		Military Mike (4EM33D10)
4EC60A12	Two		"
4EC60A14	One	Selective Calling	"
4EC60A15	Two	Selective Calling	"
4EC60A16	One		Handset (4EM34A10)
4EC60A18	One	Selective Calling	"
4EC60A19	Two		"
4EC60A21	Two	Selective Calling	"
4EC60A22	One	Accessory Jack	Military Mike (4EM33D10)
4EC60A24	Two	Accessory Jack	" " "
4EC60A26	One	Accessory Jack & Selective Calling	" " "
4EC60A27	Two	Accessory Jack & Selective Calling	" " "
4EC60A28	One	Channel Guard	Military Mike (4EM33D10)
4EC60A29	Two	Channel Guard	" " "
4EC60A30	One	Accessory Jack & Channel Guard	" " "
4EC60A31	Two	Accessory Jack & Channel Guard	" " "
4EC60A32	One	Channel Guard	Handset (4EM34A10)
4EC60A33	Two	Channel Guard	" " "
4EC66A10	One		Weatherproof Mike (4EM25C10)
4EC66A11	Two		"
4EC66A12	One	Channel Guard or Sel. Call	"
4EC66A13	Two	Channel Guard or Sel. Call	"
4EC66A14	One	Accessory Jack	"
4EC66A15	Two	Accessory Jack	"
4EC66A16	One	Accessory Jack & Channel Guard or Selective Calling	"
4EC66A17	Two	Accessory Jack & Channel Guard or Selective Calling	"



Extended Local Control EC-66-A consists of a weatherproof case containing all operating controls, microphone connections and a terminal board for the control cable connections.

#### AUDIO OUTPUT SWITCH (EC-60-A only)

In earlier units the audio output switch (marked H1-L0) permitted the selection of two audio output levels. Switching S702 to the HI position shunted biasing resistor R704 in the emitter circuit of audio output transistor Q701. This decrease in bias caused more collector current to flow, and allowed a one-watt audio output at the speaker. The unit could be operated with the one-watt output in areas having a high ambient noise level.

In low noise areas, S702 could be switched to the L0 position. Then, R704 operates in series with R703 to increase the emitter bias and reduced the collector current from 250 milliamps to 50 milliamps. With the VOLUME control all the way to the right, the unit would provide 100-milliwatts audio output, with less than 10% distortion.

#### 10-WATT AUDIO AMPLIFIER 19B205165-G1 (Optional with 6 and 12 Volt Power Supplies and EC-66-A Control Unit)

The 19B205165-G1 Audio Amplifier is located under the transmitter-receiver top mounting cover. To gain access to the amplifier, remove the power supply and the transmitter-receiver wrap-around cover. Then remove the two Phillips screws as indicated on the chassis and hinge open the top cover.

The audio signal from the receiver is coupled through matching transformer T2 to the bases of Class B push-pull transistors Q1 and Q2. Base Bias is provided by resistors R2, R3, R4, R5 and RT1. R3 and R4 may be shorted by jumper leads to provide proper bias for the three supply voltages. Thermistor RT1 and resistor R2 form a parallel compensating network which stabilizes the emitter current of Q1 and Q2 under varying temperature conditions. The output taken from the emitters of Q1 and Q2 is fed through impedance matching auto-transformer T1 to speaker LS701.

When the power supply input voltage is changed, the positions of plug pins P1, P2 and P3 on the power amplifier component board must be changed as indicated on the Service Diagram.

#### NOTE

Speaker LD701 terminals 1 & 2 are above ground and should not be grounded when testing speaker or audio output.

#### 10-WATT AUDIO AMPLIFIER 19C317598-G1 (Optional with 24/26 Volt Power Supply and EC-66-A Control Unit)

The 19C317598-G1 Audio Amplifier is located under the transmitter-receiver top mounting cover. To gain access to the amplifier, remove the power supply and the transmitter-receiver wrap-around cover. Then remove the two Phillips screws as indicated on the chassis and hinge open the top cover.

The audio signal from the receiver is coupled to the base of Q1 which is a common emitter amplifier. Q1 drives the bases of Q2 and Q3 which, in turn, drive the bases of Q4 and Q5. Q4 and Q5 operate as complementary emitter-followers, providing 10 watts of audio power capacitively coupled through C3 to the loudspeaker. R5 is feedback circuit set at the factory.

#### ACCESSORY JACK OPTION

The Accessory Jack Option provides a weatherproof 9-pin connector (J704) on the Control Unit. Type 90 and Type 99 Tone Decoders will plug directly into this connector and function without speaker muling. The Type 90 Encoder can also be used, but required an adapter cable (Option 5460) to permit plug-in operation.



## MODULATION LEVEL ADJUSTMENT

The MOD ADJUST (R31) was adjusted to the proper setting before shipment and should not normally require readjustment. This setting permits approximately 75% modulation for the average voice level. The audio peaks which would cause overmodulation are clipped by the modulation limiter. The limiter instantaneously limits the slope of the audio wave which prevents overmodulation, but preserves the intelligibility of the transmission.

### TEST EQUIPMENT

1. An audio oscillator
2. A frequency modulation monitor
3. An output meter or a VTVM

### PROCEDURE

1. Connect the audio oscillator and the meter across J5 (Mike High) and J8 (Mike Low) on the transmitter board.
2. For transmitters without Channel Guard:
  - a) Apply a 0.5 volt signal at 1000 Hz to J5.
  - b) Set MOD ADJUST (R31) for a 4.5-kilohertz swing with the deviation polarity + or - (whichever gives the highest reading) as indicated on the frequency modulation monitor.
3. For transmitters with Channel Guard:
  - a) Set the Tone Adj Control (R613) for 0.75 kHz tone deviation.
  - b) Apply a 0.5 volt signal at 1000 Hz to J5.
  - c) Set MOD ADJUST (R31) for a 4.5-kilohertz swing with the deviation polarity + or - (whichever gives the highest reading) as indicated on the frequency modulation monitor.

## PA POWER INPUT

For FCC purposes, the PA power input can be determined by measuring the Collector Voltage and the Collector Current indication, and using the following formula:

$$P_i = \frac{\text{Collector Voltage} \times \text{Collector Current Indication}}{0.51}$$

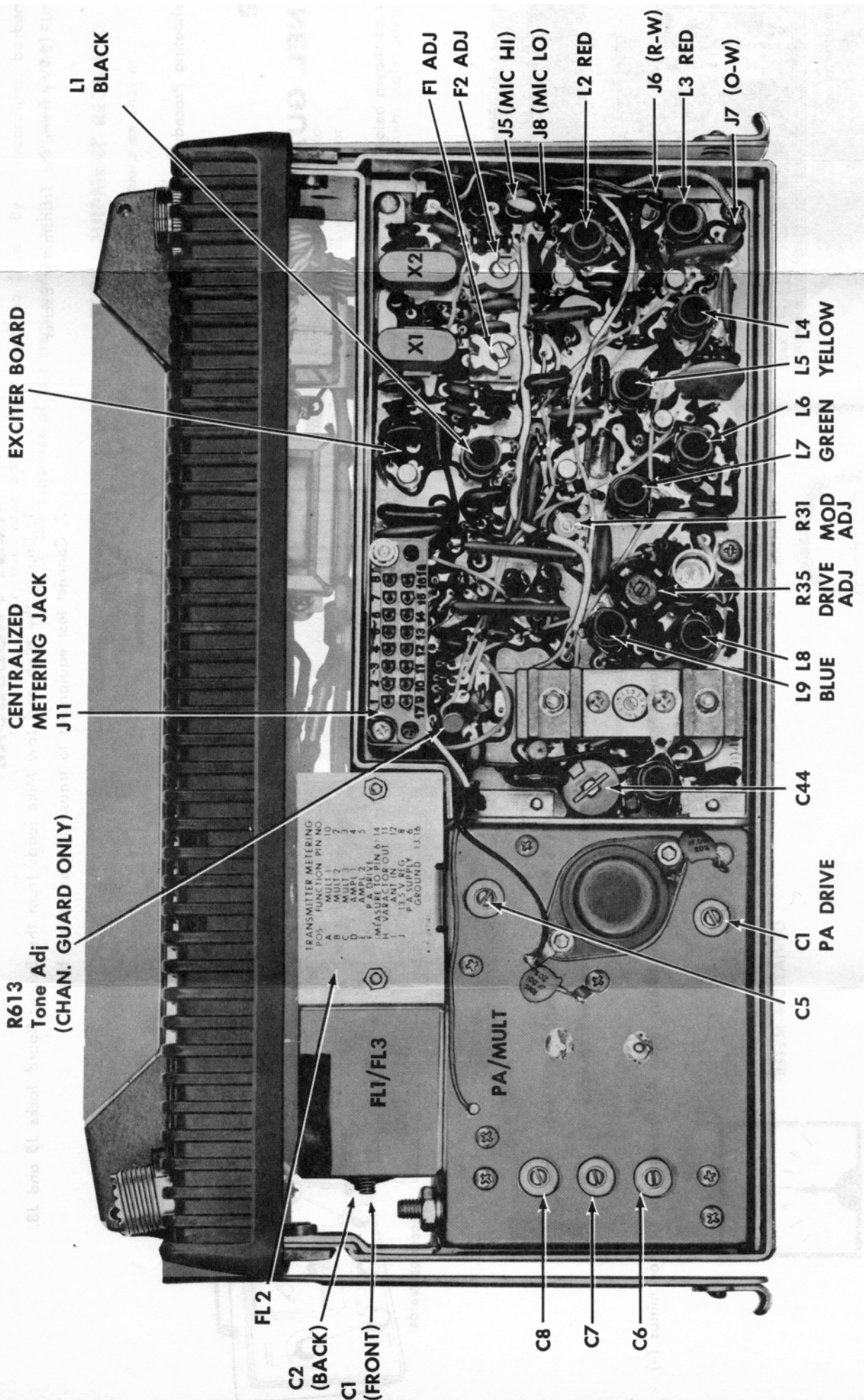
Where:

$P_i$  is the power input in watts.

Collector voltage is measured between J11-14 and J11-13 with external leads of GE Test Set using the 100-volt scale, or with multimeter.

Collector current indication is measured with GE Test Set in position F, using the TEST 1 scale (or measured from J11-6 to J11-14 with multimeter).

0.51 is the value of the collector current metering resistor in ohms.



**R613**  
Tone Adj  
(CHAN. GUARD ONLY)

**CENTRALIZED**  
**METERING JACK**  
J11

**EXCITER BOARD**

**L1**  
**BLACK**

**FL2**

**C2**  
(BACK)

**C1**  
(FRONT)

**FL1/FL3**

TRANSMITTER METERING  
 PA DRIVE  
 MULT 1 10  
 MULT 2 2  
 MULT 3 3  
 MULT 4 4  
 MULT 5 5  
 PA DRIVE  
 MEASUREMENTS  
 ANT IN 12  
 ANT OUT 8  
 13.5 V REG  
 GROUND 13, 16

**PA/MULT**

**C8**

**C7**

**C6**

**F1** ADJ

**F2** ADJ

**J5** (MIC HI)

**J8** (MIC LO)

**L2** RED

**J6** (R-W)

**L3** RED

**J7** (O-W)

**C5**

**C1**  
PA DRIVE

**C44**

**L9** L8  
BLUE

**R35** R31  
DRIVE MOD  
ADJ

**L7** L6 L5 L4  
GREEN YELLOW

**J6** (R-W)  
**L3** RED  
**J7** (O-W)

# TRANSMITTER ALIGNMENT

## EQUIPMENT REQUIRED

1. General Electric Centralized Metering Test Set Model 4EX3A10
2. A 20,000 ohms-per-volt Multimeter
3. Wattmeter

## PRELIMINARY CHECKS AND ADJUSTMENTS

1. Turn DRIVE ADJUST R35 (on Exciter Board) all the way to the right.
2. Turn PA DRIVE C1 (on PA/MULT Assembly) all the way to the right, and then turn it one turn to the left.
3. Key the transmitter and check for 35 volts at J6 (or 22 volts with dry battery pack), and for 24 volts at J7 with Multimeter.
4. Connect Test Set Model 4EX3A10 to the Transmitter Centralized Metering Jack J11. If using Multimeter, connect the negative lead to J11-13 (Ground) except for steps 6 and 9.

### NOTE

For units equipped with the rechargeable battery pack, always recharge the battery while aligning the transmitter.  
For units with the dry battery pack, insert fresh batteries before aligning the transmitter.

STEP	METERING POSITION		TUNING CONTROL	METER READING	PROCEDURE
	TEST SET 4EX3A10	Multimeter + at J11			
EXCITER BOARD					
1.	A	Pin 10	L1 (Black)	Maximum	Key the transmitter and tune L1 for maximum meter reading. For transmitters with Channel Guard, this is a critical adjustment.
2.	B	Pin 2	L3 and L2 (Red)	Maximum	Key the transmitter and tune L3 and then L2 for maximum meter reading.
3.	C	Pin 3	L5 and L4 (Yellow)	Maximum	Key the transmitter and tune L5 and then L4 for maximum meter reading.
4.	D	Pin 4	L6 and L7 (Green)	Maximum	Key the transmitter and tune L6 and L7 for maximum meter reading.
5.	E	Pin 5	L8 and L9 (Blue)	Maximum	Key the transmitter and tune L8 and L9 for maximum meter reading.
PA/MULTIPLIER ASSEMBLY					
6.	F	Pin 14 (-) and Pin 6 (+)	C44 (on Exciter, C1, C5 and C6 (on PA/MULT)	See Procedure	Key the Transmitter and tune C44, C1 and C5 for maximum meter reading. Then tune C6 for minimum meter reading. If no reading is obtained, turn PA DRIVE (C1) to the right until a reading is obtained.
7.	H	Pin 11	C7, C8 and C6	Maximum	Key the transmitter and tune C7, C8 and then C6 for maximum meter reading.
8.	I	Pin 12	F11-C1 and -C2	Maximum	Key the transmitter and tune F11-C1 and C2 for maximum meter reading (use wattmeter for more accurate reading).
FINAL ALIGNMENT					
9.	F	Pin 14 (-) and Pin 6 (+)	L6, L7, L8, L9 and C44 (on Exciter)	Maximum	Key the transmitter and tune L6, L7, L8, L9 and C44 for maximum meter reading.
10.	I	Pin 12	C1, C5, C6, C7, C8 and F11-C1, C2 (on PA/MULT)		Key the transmitter and tune C1, C5, C6, C7, C8 and F11-C1 and C2 for maximum meter reading (use wattmeter for more accurate reading).

11.				Let PA/MULT ASSEMBLY cool to room temperature.
12.				Check output of transmitter. If less than 8 watts (132-165 MHz) or 6 watts (165-174 MHz) with the rechargeable battery pack, or 5 watts with the dry battery pack, increase power output of Exciter Board by turning R35 (DRIVE ADJUST) one-quarter turn to the left. Then repeat Steps 9 through 12.
13.				NOTE _____ To maintain specified rechargeable battery life, reading at Position F should not exceed 0.5 VDC. If reading exceeds 0.5 VDC, turn R35 (DRIVE ADJUST), slightly to the right and repeat Steps 9 through 11.
FREQUENCY ADJUSTMENT				
14.				With no modulation, key the transmitter and adjust C24 (and C25 for two-frequency) for correct frequency.  NOTE _____  For proper frequency control of the transmitter, it is recommended that all frequency adjustments be made when the equipment is at a temperature of approximately 75° F. In no case should frequency adjustments be made when the equipment is outside the temperature range of 50° to 90° F.



# TRANSMITTER TEST PROCEDURES

The Transmitter Test Procedures are designed to assist you in servicing a transmitter that is operating — but not properly. Problems encountered could be low power output, low B plus, tone and voice deviation, defective audio sensitivity and modulator adjust control set too high. By following the sequence of test steps starting with

Step 1, the defect can be quickly localized. Once a defect is pin-pointed, refer to the "Service Check" and the additional corrective measures included in the Transmitter Trouble-shooting Procedure RC-1076. Before starting with the Transmitter Test Procedures, be sure the transmitter is tuned and aligned to the proper operating frequency.

## TEST EQUIPMENT REQUIRED

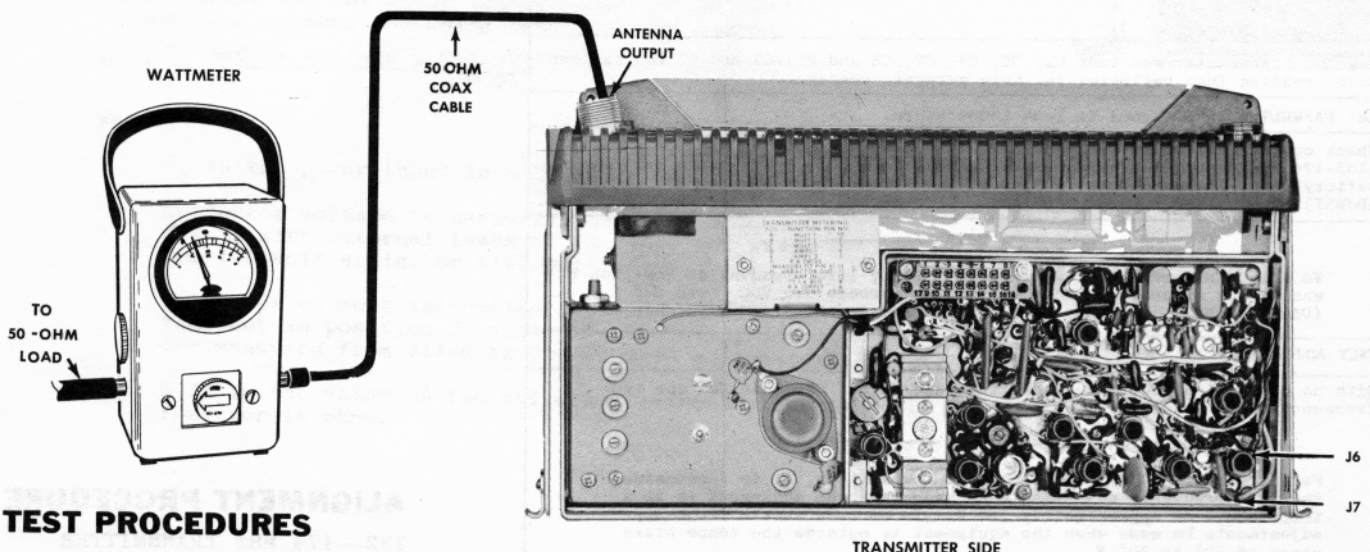
for test hookup as shown:

1. Wattmeter similar to:  
Bird #43  
Jones #711N
2. VTVM similar to:  
Triplett #850  
Heath #IM-21
3. Audio Generator similar to:  
G-E MODEL 4EX6A10 or  
Heath #IG-72
4. Deviation Meter (with a .75 kHz scale) similar to:  
Measurements #140  
Lampkin #205A
5. Multimeter similar to:  
G-E METERING TEST SET MODEL 4EX3A10 or  
Triplett #631 or  
20,000 ohms-per-volt voltmeter

## STEP 1

### POWER MEASUREMENT TEST PROCEDURE

1. Connect transmitter output to wattmeter as shown below:



### TEST PROCEDURES

132—174 MHz TRANSMITTER  
TYPE ET-62-A  
PORTA. MOBIL

(RC-1099F)

2. Key transmitter and check wattmeter for minimum reading of:

- A. 5 watts (dry battery) 132-174 MHz
- B. 8 watts (nickel cadmium battery) 132-165 MHz
- C. 6 watts (nickel cadmium battery) 165-174 MHz

## SERVICE CHECK

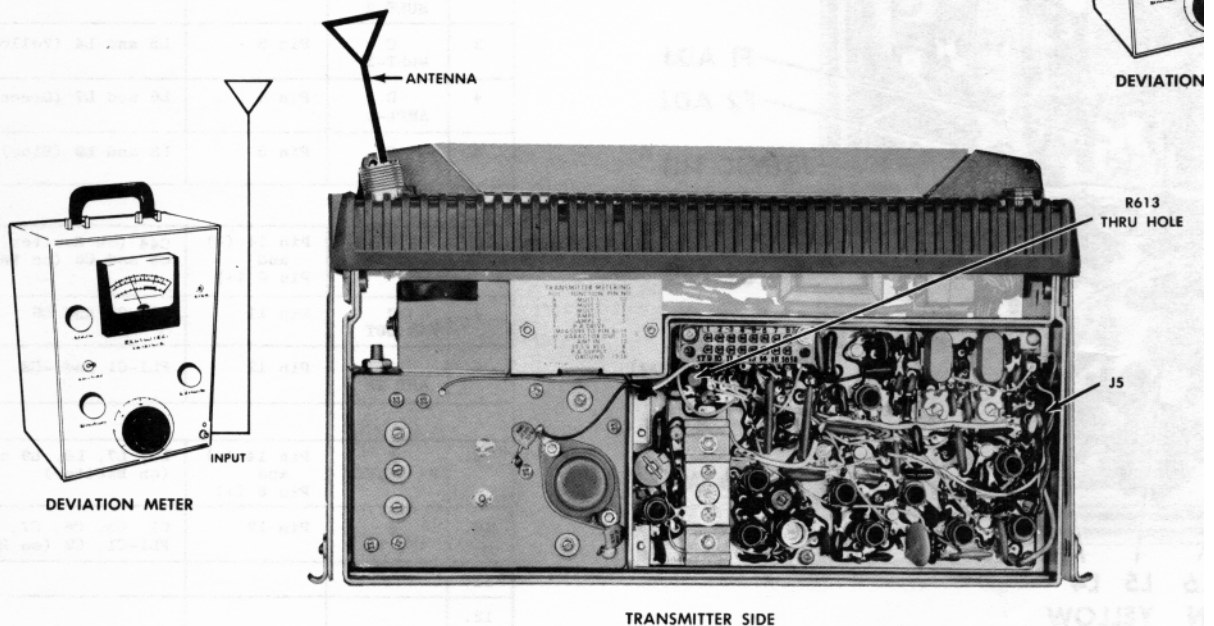
Check the following if the above readings are not obtained:

1. Disconnect red wire from J6 (32V) and orange wire from J7 (24V) from the Transmitter Exciter Board as shown, and check power supply voltages for:
  - A. 24 and 32 volts (nickel cadmium or mobile supply)
  - B. 24 and 24 volts (dry battery)
2. Refer to Power Supply Troubleshooting Steps on Troubleshooting Procedure RC-1076, and Step 13 on the Transmitter Alignment Chart.

## STEP 2

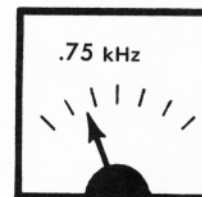
### STONE DEVIATION WITH CHANNEL GUARD TEST PROCEDURE

1. Set up Deviation Meter and monitor output of transmitter as shown below.



2. Unplug the MIC HI terminal from J5 on Transmitter Exciter Board.
3. Key transmitter and check for 0.75 kHz deviation. If reading is low or high, adjust Tone Deviation Control (R613) for a reading of 0.75 kHz.

DEVIATION METER



## NOTES:

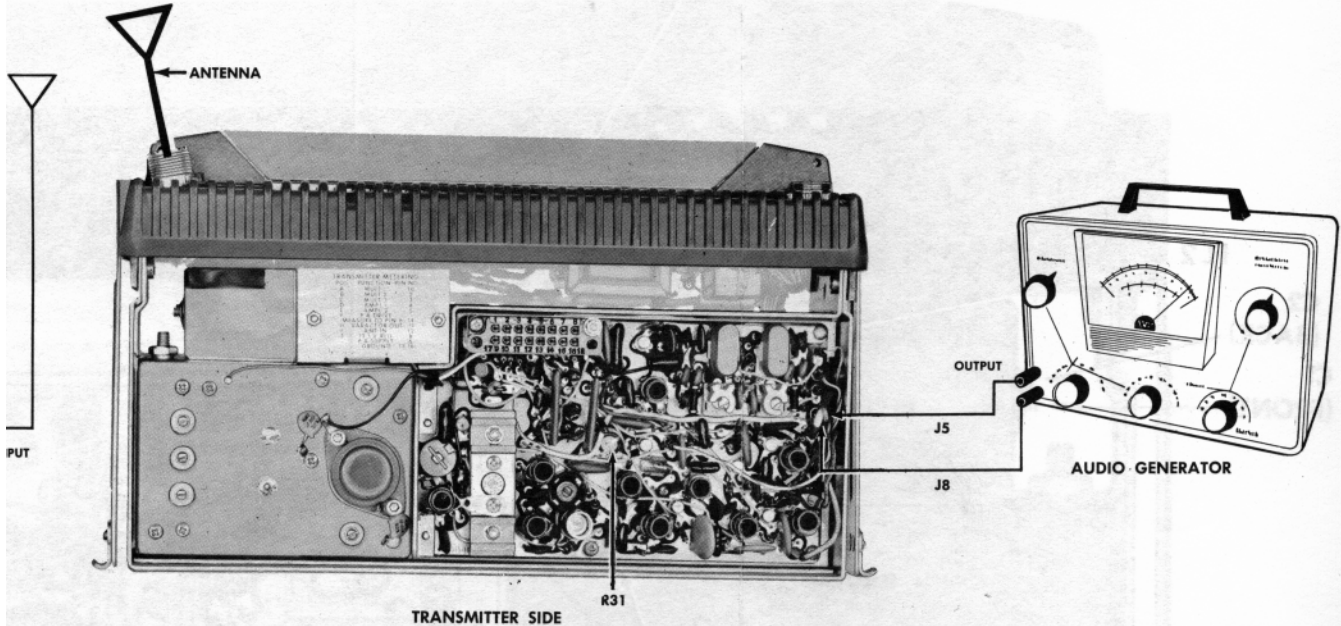
1. On units supplied with "Tone Squelch," the Phase Modulator Tuning should be peaked carefully to insure proper performance. (Refer to Step 1 in the Transmitter Alignment Chart on reverse side of page).
2. The Tone Deviation Test Procedures should be repeated every time the Tone Frequency is changed.

## SERVICE CHECK

If the 0.75 kHz deviation is not obtainable when adjusting R613, replace the Tone Transmitter reed.

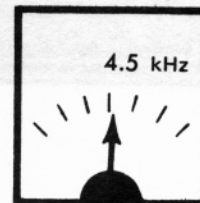
## STEP 3 VOICE DEVIATION AND SYMMETRY TEST PROCEDURE

1. Unplug the High and Low Mike leads from the Exciter Board Jacks J5 and J8.
2. Connect test equipment to transmitter as shown below:



3. Set the generator output to 0.5 VOLTS RMS, and frequency to 1 kHz
4. Key the transmitter and adjust Deviation Meter to carrier frequency.
5. Deviation reading should be  $\pm 4.5$  kHz
6. Adjust "Modulator Adjust Control" R31 until deviation reads 4.5 kHz on plus (+) or minus (-) deviation, whichever is greater.

DEVIATION METER

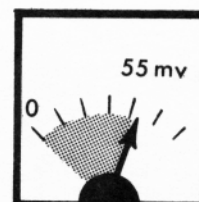


## SERVICE CHECK

If the deviation reading plus (+) and minus (-) differs by more than 1 kHz, check the following:

1. Recheck Step 1 as shown in the Transmitter Alignment Chart.
2. Check Audio Sensitivity by reducing generator output until deviation falls to 3.3 kHz. Voltage should be LESS than 55 millivolts.

METER



## FRONT END ALIGNMENT

These instructions are for tuning the oscillator and RF stages of the receiver and may be used when changing the receiver crystal or frequency. When necessary to realign the entire receiver, refer to the COMPLETE RECEIVER ALIGNMENT.

### EQUIPMENT REQUIRED

1. G-E Test Set Model 4EX3A10, 4EX8K11, or 20,000 ohms-per-volt Multimeter.
2. A 130-174 MHz Signal Source. Keep signal level below saturation.

### PRELIMINARY CHECKS AND ADJUSTMENTS

1. Plug in the Test Set 4EX3A10 or 4EX8K11 to the receiver centralized metering jack J312. Set Meter Polarity Switch on + and Meter Sensitivity Switch to 1. If using Multimeter, connect the negative lead to J312-13 (Ground).
2. Switch Test Set to Position "I" (or measure at J302 with Multimeter). Reading should be at least 12 volts.
3. Switch to Position "J" (or measure across R372 with Multimeter) and adjust Voltage Regulation Potentiometer R372 for a reading of 10 volts.
4. Turn SQUELCH control fully clockwise and VOLUME control to minimum. Switch to Position "G" (or measure at J312-9 with Multimeter) and adjust PA Bias Potentiometer R366 for a reading of 0.25 volt.

### ALIGNMENT PROCEDURE

STEP	METERING POSITION		TUNING CONTROL	METER READING	PROCEDURE
	4EX3A10	Multimeter + at J312			
1.	D OSC	pin 4	L425 (& L428 for two-frequency), L426 and L427	See Procedure	Tune L425 (L428 for two-frequency) and L426 for maximum meter reading. Then tune L427 for minimum reading.
2.	C LIM-2	pin 3	C302, C303, C309 & C310	Maximum	Apply an on-frequency signal to J301 and tune C302, C303, C309 and C310 for maximum meter reading.
3.			C302 & C303	See Procedure	While receiving a weak on-frequency signal at the Antenna, tune C302 and C303 for maximum quieting.
4.	A DISC	pin 10	L425 & L428 (two-frequency only)	Zero	Apply an on-frequency signal to J301 and tune L425 (and L428 for two-frequency) for zero discriminator reading.  <p style="text-align: center;">— NOTE —</p> For proper frequency control of the receiver it is recommended that all frequency adjustments be made when the equipment is at a temperature of approximately 75°F. In no case should frequency adjustments be made when the equipment is outside the temperature range of 50° to 90°F.

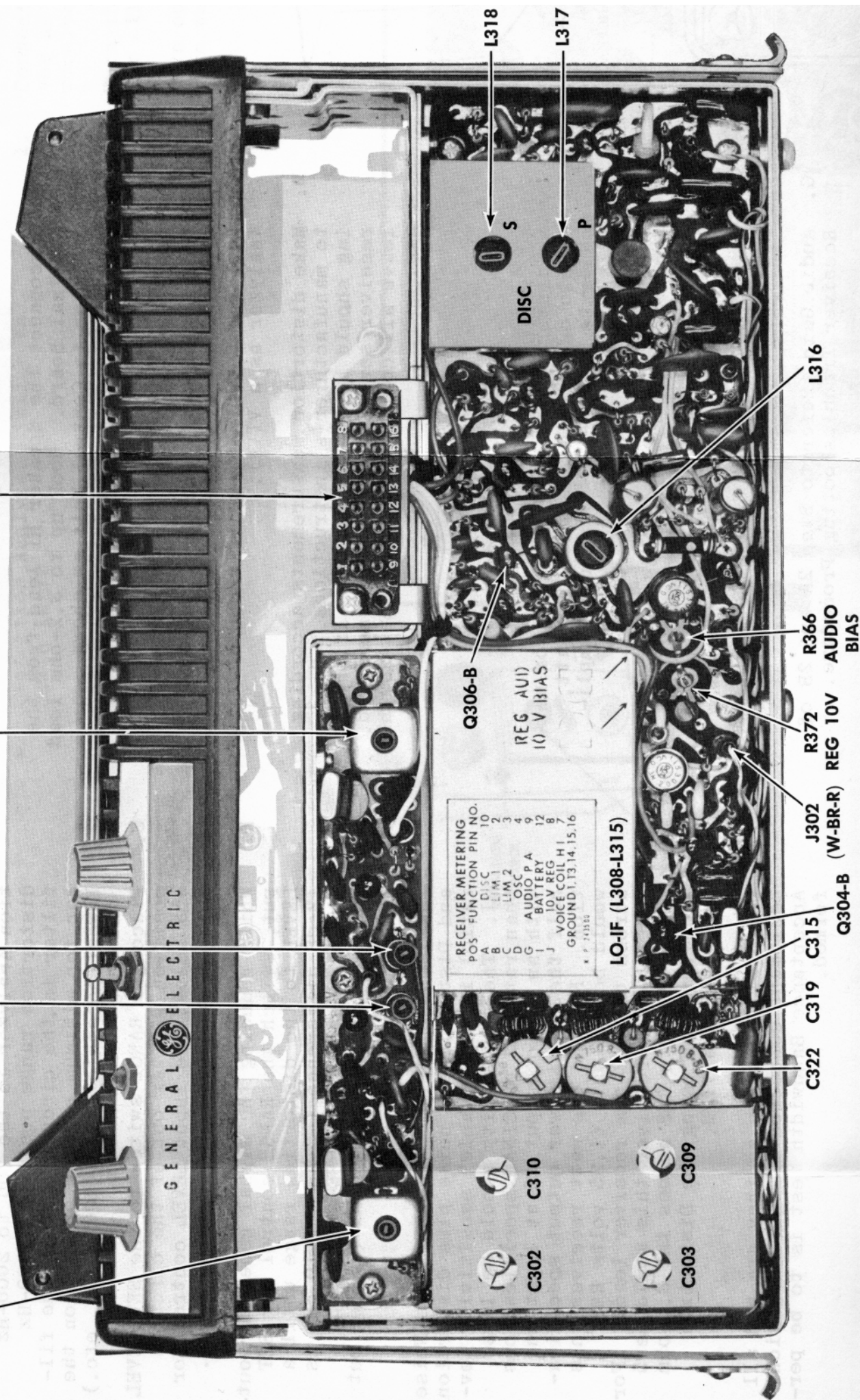


L428 (F2)

L427 L426

L425 (F1)

CENTRALIZED METERING JACK J312



RECEIVER METERING

POS	FUNCTION	PIN NO.
A	DISC	10
B	LIM 1	2
C	LIM 2	3
D	OSC	4
G	AUDIO P.A.	9
H	BATTERY	12
I	10V REG	8
J	VOICE COIL	H, 7
	GROUND	1, 13, 14, 15, 16

R. P. 143555

Q306-B  
REG AUD  
10 V BIAS

C302 C310 C309 C303

LO-IF (L308-L315)  
J302 (W-BR-R)  
Q304-B  
R372 REG 10V  
R366 AUDIO BIAS

DISC  
S P  
L318  
L317

L316

GENERAL ELECTRIC

## COMPLETE RECEIVER ALIGNMENT

### EQUIPMENT REQUIRED

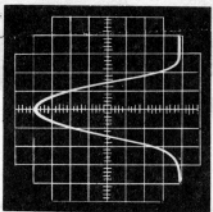
1. G-E Test Set Model 4EX3A10, 4EX8K11, or 20,000 ohms-per-volt Multimeter.
2. A 455-kHz, 10.7 MHz and 130-174 MHz Signal Source. Couple the 455-kHz signal through a small capacitor (approximately 100 pf). Couple the 10.7 MHz signal through a .01  $\mu$ f capacitor for Hi IF, and through a 100 pf capacitor for Low IF adjustment. Keep signal levels below saturation.

### PRELIMINARY CHECKS AND ADJUSTMENTS

1. Plug in the Test Set 4EX3A10 or 4EX8K11 to the receiver centralized metering jack J312. Set Meter Polarity Switch on + and Meter Sensitivity Switch to TEST 1. If using Multimeter, connect the negative lead to J312-13 (Ground).
2. Switch Test Set to Position "I" (or measure at J302 with Multimeter). Reading should be at least 12 volts.
3. Switch to Position "J" (or measure across R372 with Multimeter) and adjust Voltage Regulation Potentiometer R372 for a reading of 10 volts.
4. Turn SQUELCH control fully clockwise and VOLUME control to minimum. Switch to Position "G" (or measure at J312-9 with Multimeter) and adjust PA Bias Potentiometer R366 for a reading of 0.25 volt.

### ALIGNMENT PROCEDURE

STEP	METERING POSITION TEST SET Multimeter 4EX3A10 + at J312	TUNING CONTROL	METER READING	PROCEDURE
DISCRIMINATOR				
1.	C LIM-2	Pin 3	0.3 v (1.1 v with Multi- meter)	Apply a 455-kHz signal to the base of Q306 and adjust signal level for 0.3 volt meter reading (to saturate limiters).
2.	A DISC	Pin 10	Zero	Apply a 455-kHz signal as above and adjust L318 (disc secondary) for zero meter reading.
3.	A DISC	Pin 10	0.65 v (1.6 v with Multi- meter)	Alternately apply a 445-kHz and 465-kHz signal while adjusting L317 and L318 for readings of at least 0.65 volt. Both readings should be within 10%.
4.	B LIM-1	Pin 2	Maximum	Apply a 455-kHz signal as above, and tune L316 for maximum meter reading.
OSCILLATOR AND MULTIPLIER				
5.	D OSC	Pin 4	See Procedure	Tune L425 (and L428 for two-frequency) and L426 for maximum meter reading. Then tune L427 for minimum reading.
HI IF				
6.	C LIM-2	Pin 3	Maximum	Apply a 10.7-MHz signal to the base of Q302 or an on-frequency signal to Antenna Jack J702 (on Control Unit). Tune C315, C319 and C322 for maximum meter reading.

LOW IF*			
7.	A DISC	Pin 10	Zero
8.	C LIM-2	Pin 3	Maximum
9.		L308 thru L315  L308 thru L315 	
<p>Apply a 10.7-MHz signal to the base of Q304. Adjust the signal generator for discriminator zero.</p> <p>Apply signal as above. Peak L308 through L315 for maximum meter reading, keeping signal below saturation.</p> <p>Connect oscilloscope to Pin 2 and Pin 13 (Ground) of centralized metering jack J312. Modulate signal generator with at least <math>\pm 30</math> kHz deviation with 60 Hertz (or less). Tune L308 through L315 for filter pattern as shown, keeping signal level below saturation.</p> <p>The above filter alignment should result in the center of the bandpass at 455 kHz <math>\pm 1</math> kHz (<math>\pm 0.7</math> volt reading with meter in Position A), with an EIA modulation acceptance of <math>\pm 6</math> to <math>\pm 10</math> KC.</p>			
RF			
10.	C LIM-2	Pin 3	Maximum
11.			See Procedure
<p>Apply an on-frequency signal to Antenna Jack and tune C302, C303, C309 and C310 for maximum meter reading.</p> <p>While receiving a weak on-frequency signal at the Antenna, tune C302 and C303 for maximum quieting.</p>			
FREQUENCY ADJUSTMENT			
12.	A DISC	Pin 10	Zero
<p>Apply an on-frequency signal to Antenna Jack and tune L425 (and L428 for two-frequency) for zero discriminator reading.</p> <p>For proper frequency control of the receiver it is recommended that all frequency adjustments be made when the equipment is at a temperature of approximately 75°F. In no case should frequency adjustments be made when the equipment is outside the temperature range of 50° to 90°F.</p>			

\* NOTE -- Low IF coils L308 through L315 have been set at the factory and will normally require no further adjustment. Do NOT realign the filter unless there is positive evidence of a defective filter. For location of IF coils, refer to the Receiver Service Sheet.

--- NOTE ---



PARTS LIST

LBI-3484J

132-174 MHz TRANSMITTER  
 MODELS 4ET62A10 - 4ET62A13

SYMBOL	GE PART NO.	DESCRIPTION
		EXCITER BOARD ASSEMBLY 19D402272G1 1 Freq 150.8-174 MHz (4ET62A12) 19D402272G2 2 Freq 150.8-174 MHz (4ET62A13) 19D402272G3 1 Freq 132-150.8 MHz (4ET62A10) 19D402272G4 2 Freq 132-150.8 MHz (4ET62A11)
		----- CAPACITORS -----
C1	5490008P137	Silver mica: 270 pf $\pm 10\%$ , 500 VDCW; sim to Electro Motive Type DM-15.
C2	5490008P131	Silver mica: 150 pf $\pm 10\%$ , 500 VDCW; sim to Electro Motive Type DM-15.
C3	7491827P5	Ceramic disc: 0.1 $\mu$ f +80% -30%, 50 VDCW; sim to Sprague 36C172.
C4	7491393P2	Ceramic disc: .01 $\mu$ f +100% -0%, 500 VDCW.
C5	5490008P144	Silver mica: 510 pf $\pm 10\%$ , 300 VDCW; sim to Electro Motive Type DM-15.
C6*	5496219P314	Ceramic disc: 27 pf $\pm 10\%$ , 500 VDCW, temp coef -150 PPM.
		Earlier than REV E:
	5496219P347	Ceramic disc: 22 pf $\pm 5\%$ , 500 VDCW, temp coef -150 PPM.
C7	5496219P347	Ceramic disc: 22 pf $\pm 5\%$ , 500 VDCW, temp coef -150 PPM.
C8 and C9	5494481P118	Ceramic disc: 4000 pf $\pm 10\%$ , 500 VDCW; sim to RMC Type JF.
C10	5496219P50	Ceramic disc: 30 pf $\pm 10\%$ , 500 VDCW, temp coef 0 PPM.
C11	5490008P143	Silver mica: 470 pf $\pm 10\%$ , 300 VDCW; sim to Electro Motive Type DM-15.
C12	5496219P245	Ceramic disc: 18 pf $\pm 5\%$ , 500 VDCW, temp coef -80 PPM.
C13	5496219P247	Ceramic disc: 22 pf $\pm 5\%$ , 500 VDCW, temp coef -80 PPM.
C14	5494481P118	Ceramic disc: 4000 pf $\pm 10\%$ , 500 VDCW; sim to RMC Type JF.
C15	5494481P114	Ceramic disc: 2000 pf $\pm 10\%$ , 500 VDCW; sim to RMC Type JF.
C16	5490008P131	Silver mica: 150 pf $\pm 10\%$ , 500 VDCW; sim to Electro Motive Type DM-15.
C17 and C18	5496219P245	Ceramic disc: 18 pf $\pm 5\%$ , 500 VDCW, temp coef -80 PPM.
C19	5494481P114	Ceramic disc: 2000 pf $\pm 10\%$ , 500 VDCW; sim to RMC Type JF.
C20	5496219P247	Ceramic disc: 22 pf $\pm 5\%$ , 500 VDCW, temp coef -80 PPM.
C21	5490008P27	Silver mica: 100 pf $\pm 5\%$ , 500 VDCW; sim to Electro Motive Type DM-15.
C22	5496219P247	Ceramic disc: 22 pf $\pm 5\%$ , 500 VDCW, temp coef -80 PPM.
C23	5496219P50	Ceramic disc: 30 pf $\pm 5\%$ , 500 VDCW, temp coef 0 PPM.
C24 and C25	5491271P106	Variable, subminiature: 2.1 to 12.7 pf, 750 v peak; sim to EF Johnson 189.
C26	5496219P50	Ceramic disc: 30 pf $\pm 5\%$ , 500 VDCW, temp coef 0 PPM.
C27	19A116080P7	Polyester: 0.1 $\mu$ f $\pm 20\%$ , 50 VDCW.
C28	4029003P104	Silver mica: 680 pf $\pm 10\%$ , 500 VDCW; sim to Electro Motive Type DM-20.
C29	5490008P135	Silver mica: 220 pf $\pm 10\%$ , 500 VDCW; sim to Electro Motive Type DM-15.

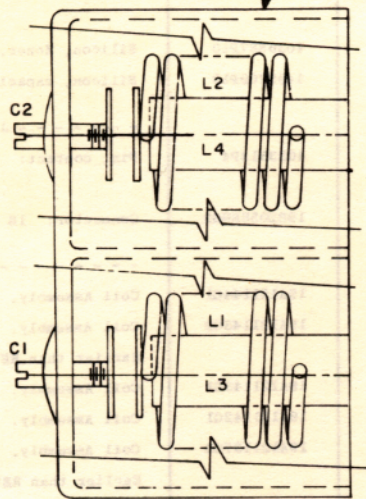
\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
C30	5490008P143	Silver mica: 470 pf $\pm 10\%$ , 300 VDCW; sim to Electro Motive Type DM-15.
C31	7491827P5	Ceramic disc: 0.1 $\mu$ f $+80\%$ $-30\%$ , 50 VDCW; sim to Sprague 36C172.
C32	19A116080P201	Polyester: 0.01 $\mu$ f $\pm 5\%$ , 50 VDCW.
C33	5496267P1	Tantalum: 6.8 $\mu$ f $\pm 20\%$ , 6 VDCW; sim to Sprague Type 150D.
C34	5494481P114	Ceramic disc: 2000 pf $\pm 10\%$ , 500 VDCW; sim to RMC Type JF.
C35	5496372P161	Ceramic disc: 390 pf $\pm 10\%$ , 500 VDCW, temp coef $-3300$ PPM.
C36	7161189P2	Disc type: 0.1 $\mu$ f $+80\%$ $-30\%$ , 50 VDCW; sim to Sprague 36C172.
C37 and C38	19C300685P93	Ceramic disc: 5 pf $\pm 0.1$ pf, 500 VDCW, temp coef 0 PPM.
C39 and C40*	5496219P10	Ceramic disc: 10 pf $\pm 10\%$ , 500 VDCW, temp coef 0 PPM.
	5496219P11	Earlier than REV E: Ceramic disc: 13 pf $\pm 10\%$ , 500 VDCW, temp coef 0 PPM.
C41	19C300685P93	Ceramic disc: 5 pf $\pm 0.1$ pf, 500 VDCW, temp coef 0 PPM.
C42*	19C300685P92	Ceramic disc: 4 pf $\pm 0.1$ pf, 500 VDCW, temp coef 0 PPM.
	19C300685P93	In Models of REV A and earlier: Ceramic disc: 5 pf $\pm 0.1$ pf 500 VDCW, temp coef 0 PPM.
C43	19A116080P3	Polyester: 0.022 $\mu$ f $\pm 20\%$ , 50 VDCW.
C44	5490446P1	Variable, ceramic: 8 to 50 pf, 350 VDCW, temp coef $-750$ PPM; sim to Erie 557-36.
C45	5494481P114	Ceramic disc: 2000 pf $\pm 10\%$ , 500 VDCW; sim to RMC Type JF.
C46	7491393P2	Ceramic disc: .01 $\mu$ f $+100\%$ $-0\%$ , 500 VDCW.
C47	5494481P18	Ceramic disc: 4000 pf $\pm 10\%$ , 500 VDCW; sim to RMC Type JF.
C48 and C49	5494481P111	Ceramic disc: 1000 pf $\pm 20\%$ , 500 VDCW; sim to RMC Type JF.
C50	5490008P135	Silver mica: 220 pf $\pm 10\%$ , 500 VDCW; sim to Electro Motive Type DM-15.
C51	5494481P115	Ceramic disc: 3000 pf $\pm 20\%$ , 500 VDCW; sim to RMC Type JF.
C52	5494481P111	Ceramic disc: 1000 pf $\pm 20\%$ , 500 VDCW; sim to RMC Type JF.
C53 and C54	5496219P315	Ceramic disc: 33 pf $\pm 10\%$ , 500 VDCW, temp coef $-150$ PPM.
C55	5494481P111	Ceramic disc: 1000 pf $\pm 20\%$ , 500 VDCW; sim to RMC Type JF.
C56	5496219P215	Ceramic disc: 33 pf $\pm 10\%$ , 500 VDCW, temp coef $-80$ PPM.
C57*	5496219P314	Ceramic disc: 27 pf $\pm 10\%$ , 500 VDCW, temp coef $-150$ PPM.
	5496219P215	Earlier than REV E: Ceramic disc: 33 pf $\pm 10\%$ , 500 VDCW, temp coef $-80$ PPM.
C58	5490008P133	Silver mica: 180 pf $\pm 10\%$ , 500 VDCW; sim to Electro Motive Type DM-15.
C59 and C60	5496219P248	Ceramic disc: 24 pf $\pm 5\%$ , 500 VDCW, temp coef $-80$ PPM.
C61	5496219P214	Ceramic disc: 27 pf $\pm 10\%$ , 500 VDCW, temp coef $-80$ PPM.
C62	5490008P129	Silver mica: 120 pf $\pm 10\%$ , 500 VDCW; sim to Electro Motive Type DM-15.
C63	5496219P214	Ceramic disc: 27 pf $\pm 10\%$ , 500 VDCW, temp coef $-80$ PPM.
C64	5494481P11	Ceramic disc: 1000 pf $\pm 20\%$ , 500 VDCW; sim to RMC Type JF.
C65*	5494481P11	Ceramic disc: 1000 pf $\pm 20\%$ , 500 VDCW; sim to RMC Type JF.
	7489162P25	In REV G and earlier: Silver mica: 82 pf $\pm 5\%$ , 500 VDCW; sim to Electro Motive Type DM-15.
C70*	19A116114P48	Ceramic: 36 pf $\pm 5\%$ , 100 VDCW; temp coef 0 PPM. Added by REV K.

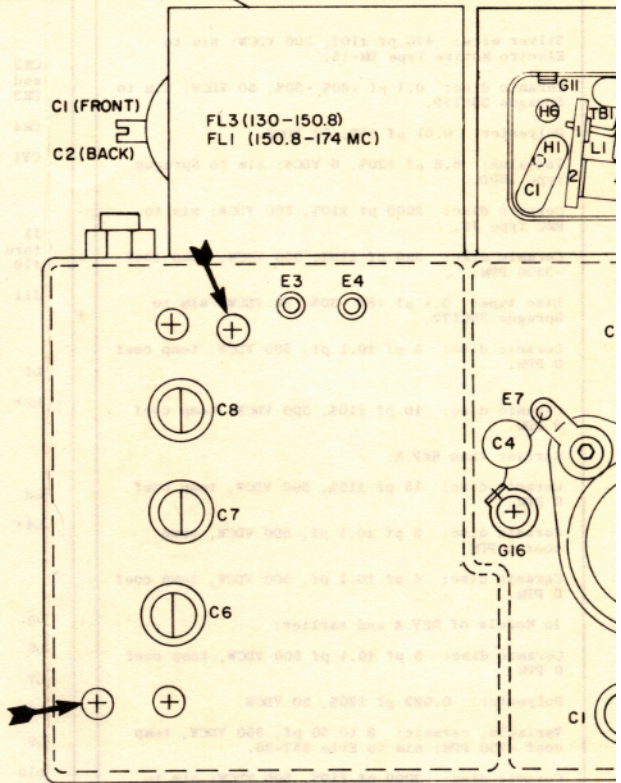
SYMBOL	GE PART NO.	DESCRIPTION
		----- DIODES AND RECTIFIERS -----
CR2 and CR3	19A115603P1	Silicon.
CR4	4036887P10	Silicon, Zener.
CV1	5495769P13	Silicon, capacitive.
		----- JACKS AND RECEPTACLES -----
J1 thru J10	4033513P4	Pin, contact: sim to Bead Chain L93-3.
J11	19B205689G2	Connector: 18 contacts.
		----- INDUCTORS -----
L1	19A121144G1	Coil Assembly. Includes tuning slug 5491798P4.
L2*	19A121143G2	Coil Assembly. Includes tuning slug 5491798P4. Earlier than REV E:
	19A121143G1	Coil Assembly. Includes tuning slug 5491798P4.
L3	19A121142G1	Coil Assembly. Includes tuning slug 5491798P4.
L4*	19A121137G2	Coil Assembly. Includes tuning slug 5491798P8. Earlier than REV E:
	19A121137G1	Coil Assembly. Includes tuning slug 5491798P8.
L5	19A121136G1	Coil Assembly. Includes tuning slug 5491798P8.
L6	19A121133G1	Coil Assembly. Includes tuning slug 5491798P8.
L7	19A121125G1	Coil Assembly. Includes tuning slug 5491798P8.
L8	19A121129G1	Coil Assembly. Includes tuning slug 5491798P8.
L9	19A121125G2	Coil Assembly. Includes tuning slug 5491798P8.
L10	7488079P9	Choke, RF: 2.7 $\mu$ h $\pm$ 10%, 1.2 ohms DC res max; sim to Jeffers 4411-13K.
L11	19A121122G1	Coil Assembly.
		----- PLUGS -----
P1 and P2	4029840P2	Contact, electrical; sim to Amp 42827-2.
		----- TRANSISTORS -----
Q1	19A115330P1	Silicon, NPN.
Q2* and Q3*	19A115328P1	Silicon, NPN.  In REV F and earlier:
	19A115315P1	Silicon, NPN; sim to Type 2N708.
Q4	19A115328P1	Silicon, NPN.
Q5	19A115294P2	Silicon, NPN.
Q6	19A115304P1	Silicon, NPN.
Q7	19C300114P1	Silicon, NPN; sim to Type 2N706.
Q8	19A115889P1	Silicon, NPN.
Q9 and Q10	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q11	19C300114P1	Silicon, NPN; sim to Type 2N706.
		----- RESISTORS -----
R1	3R77P752J	Composition: 7500 ohms $\pm$ 5%, 1/2 w.
R2	3R77P103K	Composition: 10,000 ohms $\pm$ 10%, 1/2 w.
R3	3R77P473K	Composition: 47,000 ohms $\pm$ 10%, 1/2 w.
R4	3R77P102K	Composition: 1000 ohms $\pm$ 10%, 1/2 w.
R5	3R77P393K	Composition: 39,000 ohms $\pm$ 10%, 1/2 w.
R6	3R77P392K	Composition: 3900 ohms $\pm$ 10%, 1/2 w.
R7	3R77P510J	Composition: 51 ohms $\pm$ 5%, 1/2 w.
R8	3R77P101K	Composition: 100 ohms $\pm$ 10%, 1/2 w.



PA/MULT ASSEMBLY



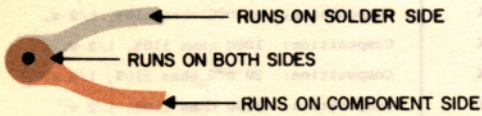
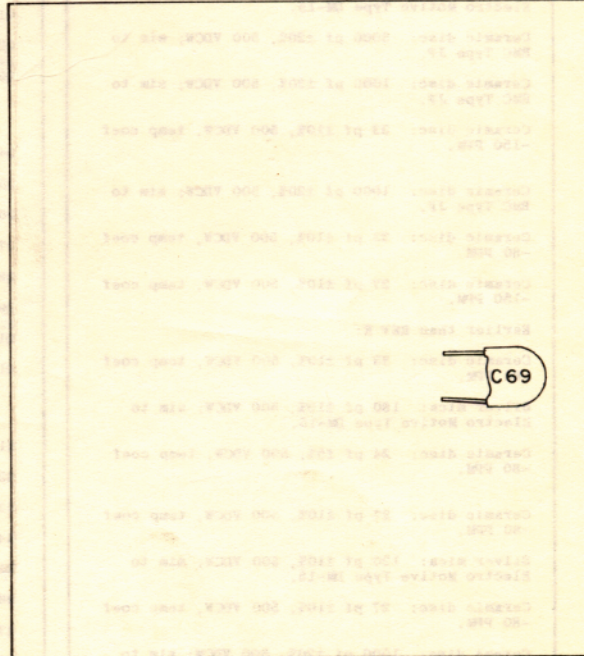
TOP VIEW



ALL READINGS ARE TYPICAL READINGS MEASURED FROM TRANSISTOR PINS TO J11-13 (GND), WITH A 20,000-OHM-PER-VOLTMETER AND THE TRANSMITTER UNKEYED. READINGS OVER 1,000 OHMS READ ON THE X1,000 SCALE OF METER +OR - SIGN SHOWS METER PROBE GROUNDED.

TRANSISTOR	EMITTER		BASE		COLLECTOR	
	+	-	+	-	+	-
EXCITER BOARD						
Q1	0	0	45 Ω	3K	6.1K	6.1K
Q2	130Ω	105Ω	250 Ω	3.5K	4K	1.9K
Q3	195Ω	100Ω	78 Ω	84Ω	4.4K	1.9K
Q4	195Ω	49 Ω	0	0	4.3K	2K
Q5	6.8Ω	7 Ω	0	0	4K	1.65K
Q6	1.5Ω	1.5Ω	0	0	4K	1.7K
Q7	2.1K	2.1K	4.7K	13K	4.7K	1.85K
Q8	580Ω	470Ω	340 Ω	11.4K	2.7K	8.2K
Q9	0	0	450 Ω	8.5K	2.65K	12.5K
Q10	0	0	450 Ω	12.2K	13K	13K
Q11	0	0	460 Ω	0.9K	4.1K	1.75K
PA/MULT						
Q1	0	0	0	0	∞	1.95K

EXCITER BOARD

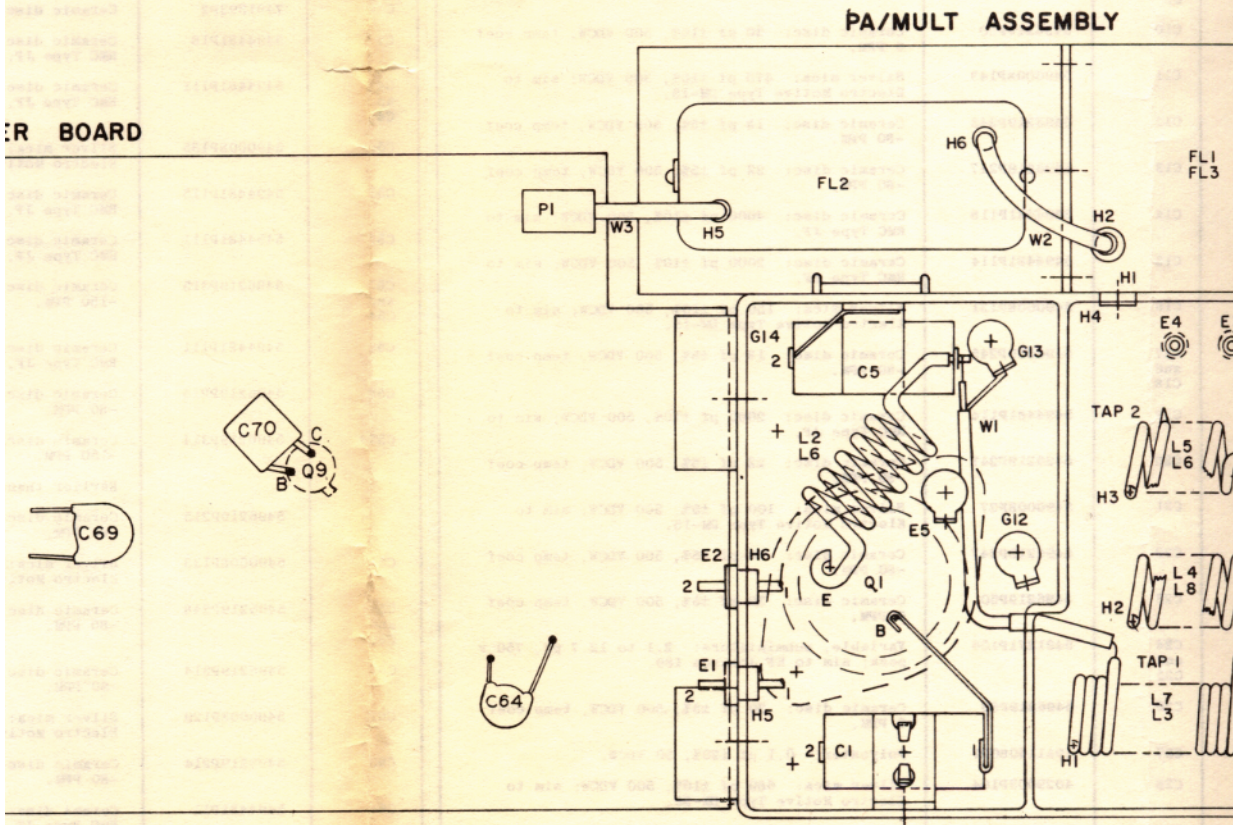
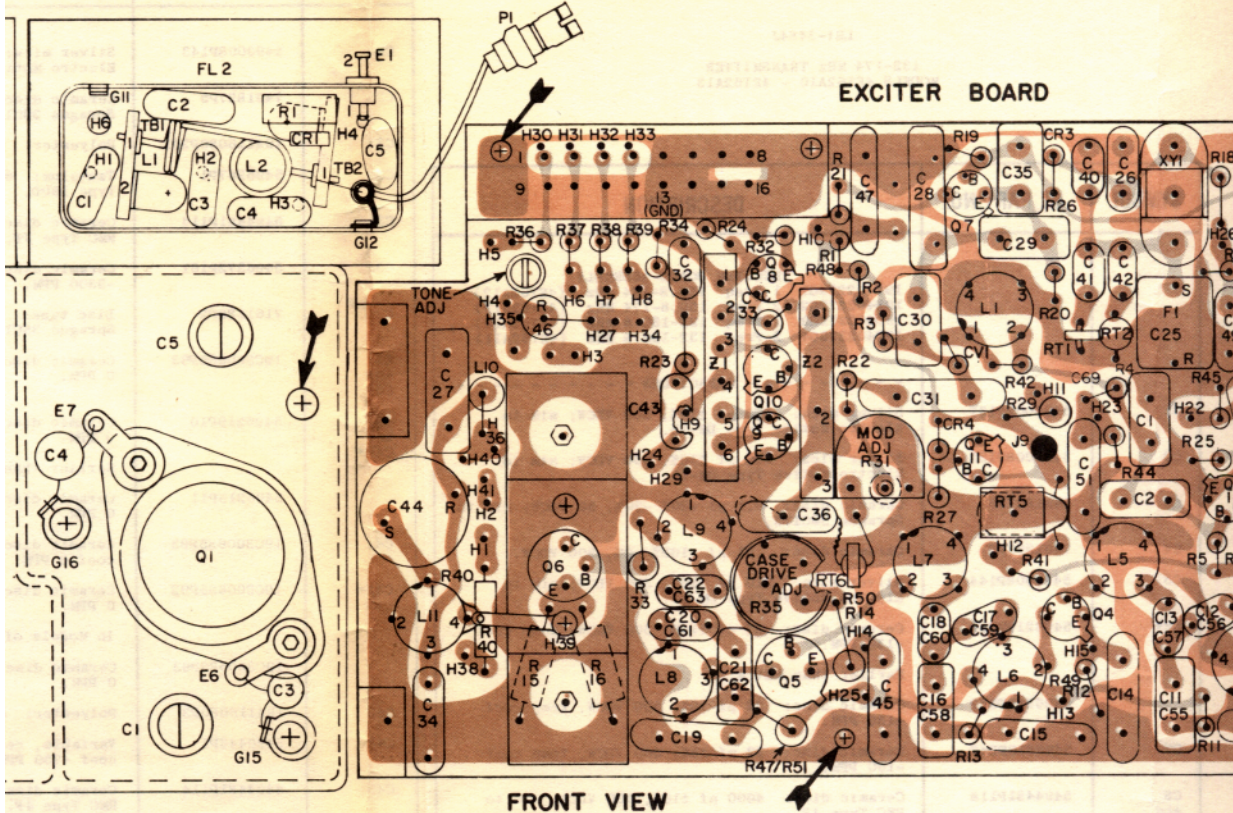


SERVICE SHEET

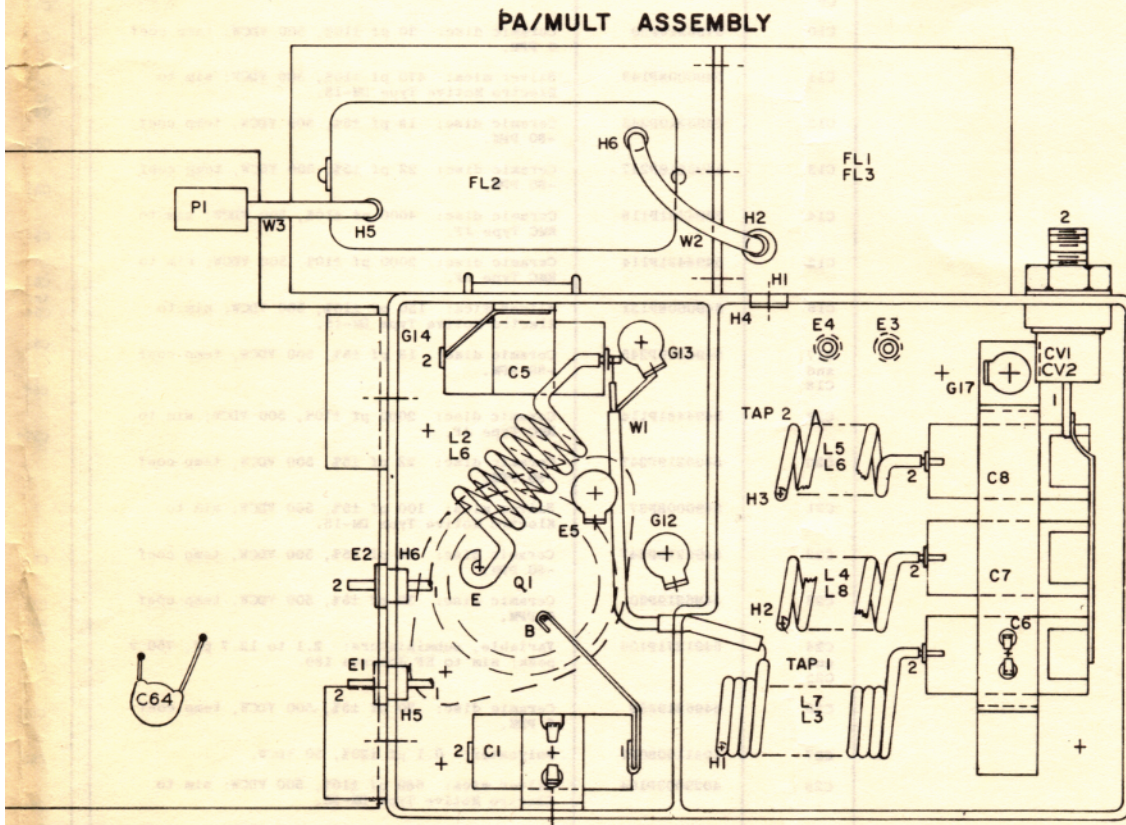
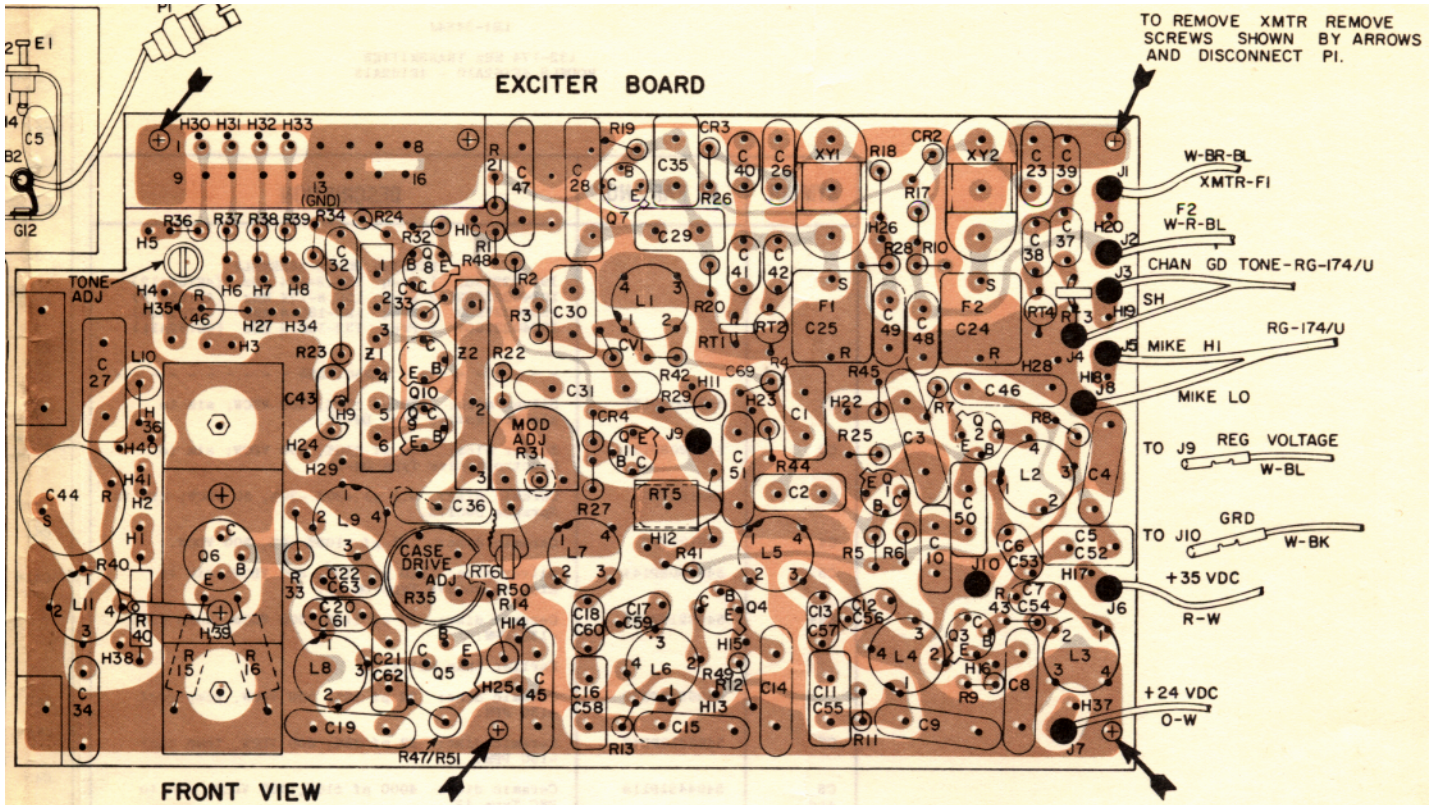
132-174 MHz TRANSMITTER  
 MODELS 4ET62A10-13  
 (RC-1072M, Sheet 1)



ASSEMBLY



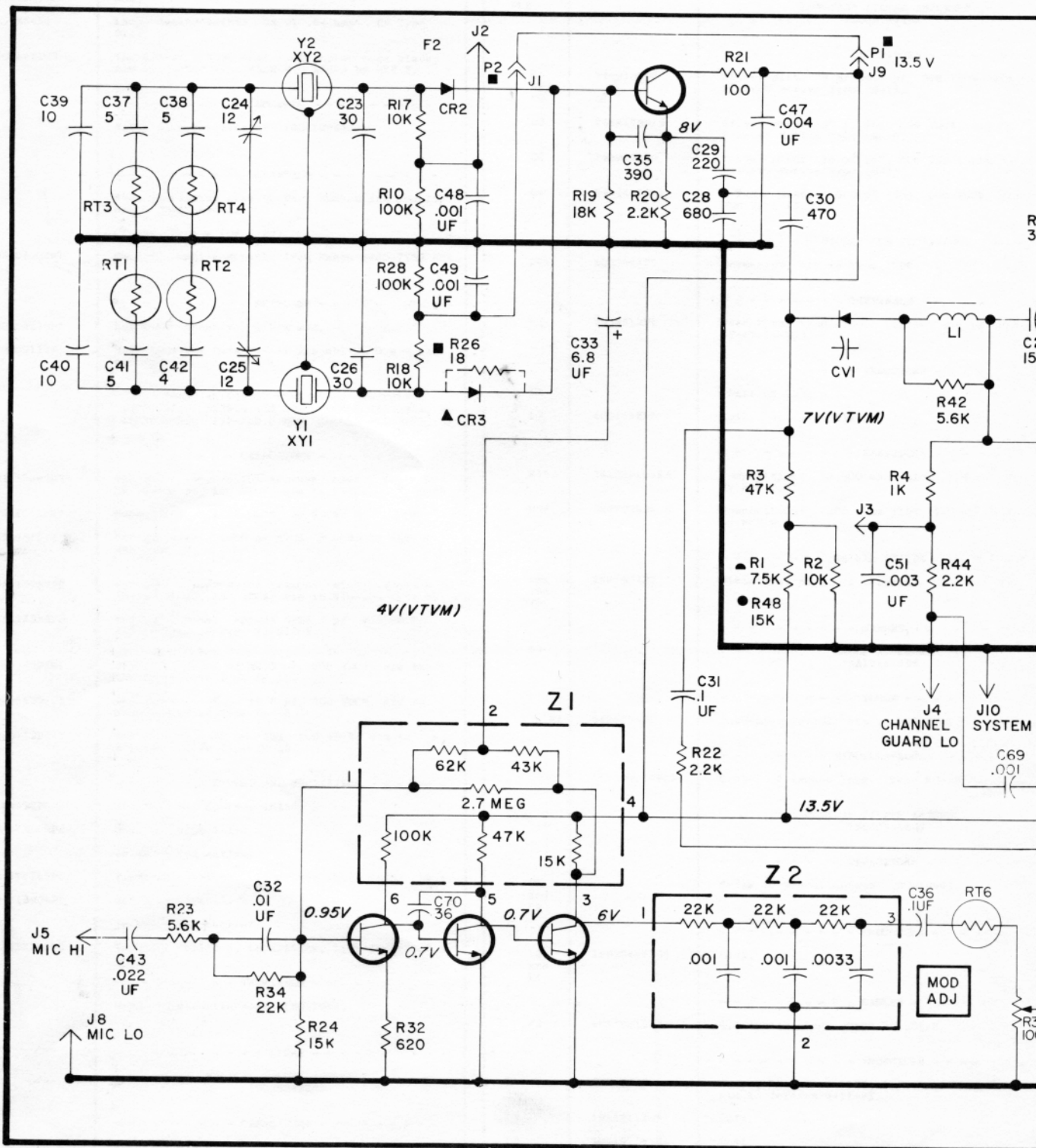




(19D402512, Rev. 8)  
 (19C303411, Sh. 1, Rev. 1)  
 (19C303411, Sh. 2, Rev. 1)



OSCILLATOR    MODULATOR  
 Q7                    CVI



AUDIO    AUDIO    LIMITER  
 Q8            Q9            Q10

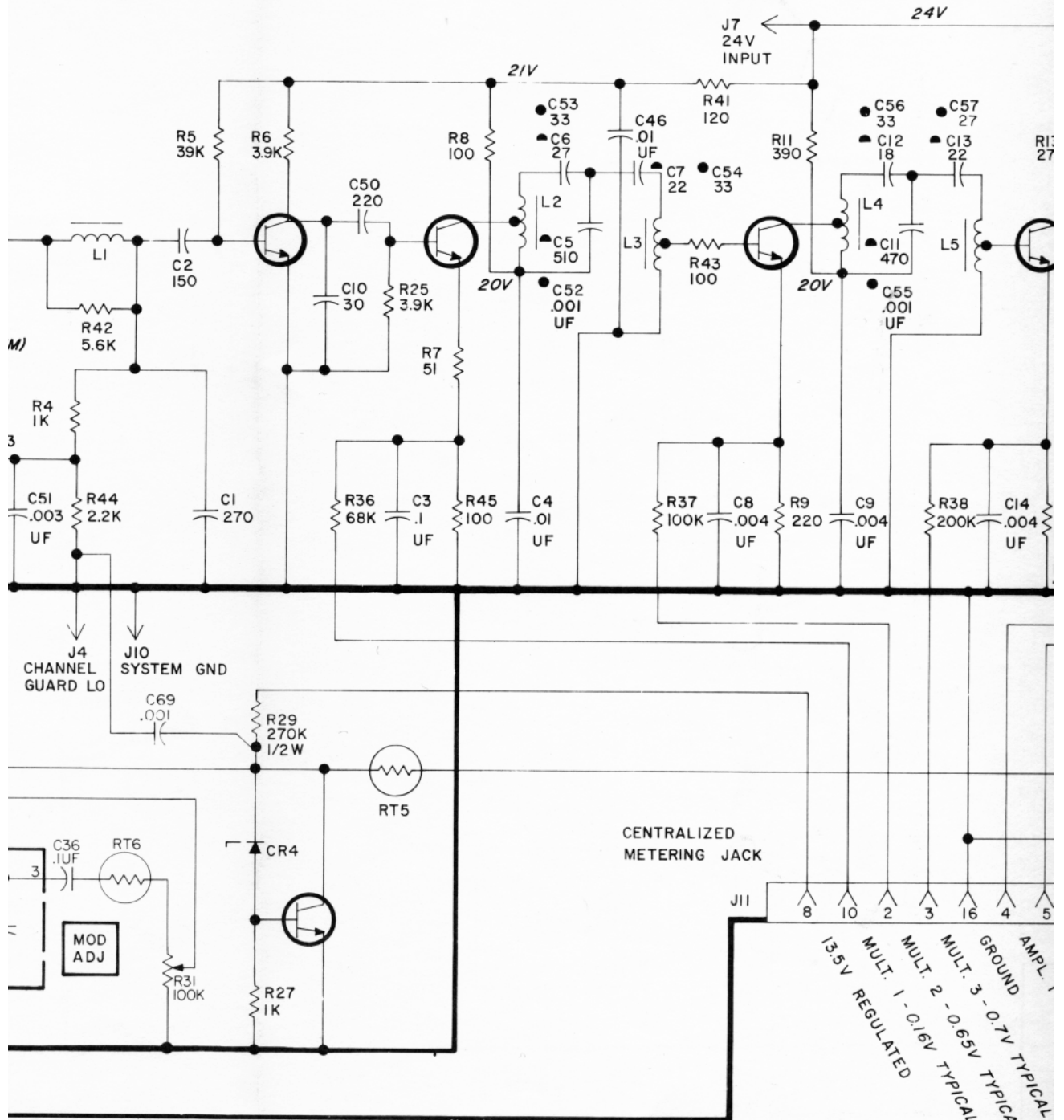
MODULATOR    BUFFER    1ST DOUBLER    2ND DOUBLER    3RD  
 CVI            Q1                    Q2                    Q3                    27

---

EXCITER BOARD

---

PI 13.5 V  
 J9



REGULATOR  
 Q11

J11

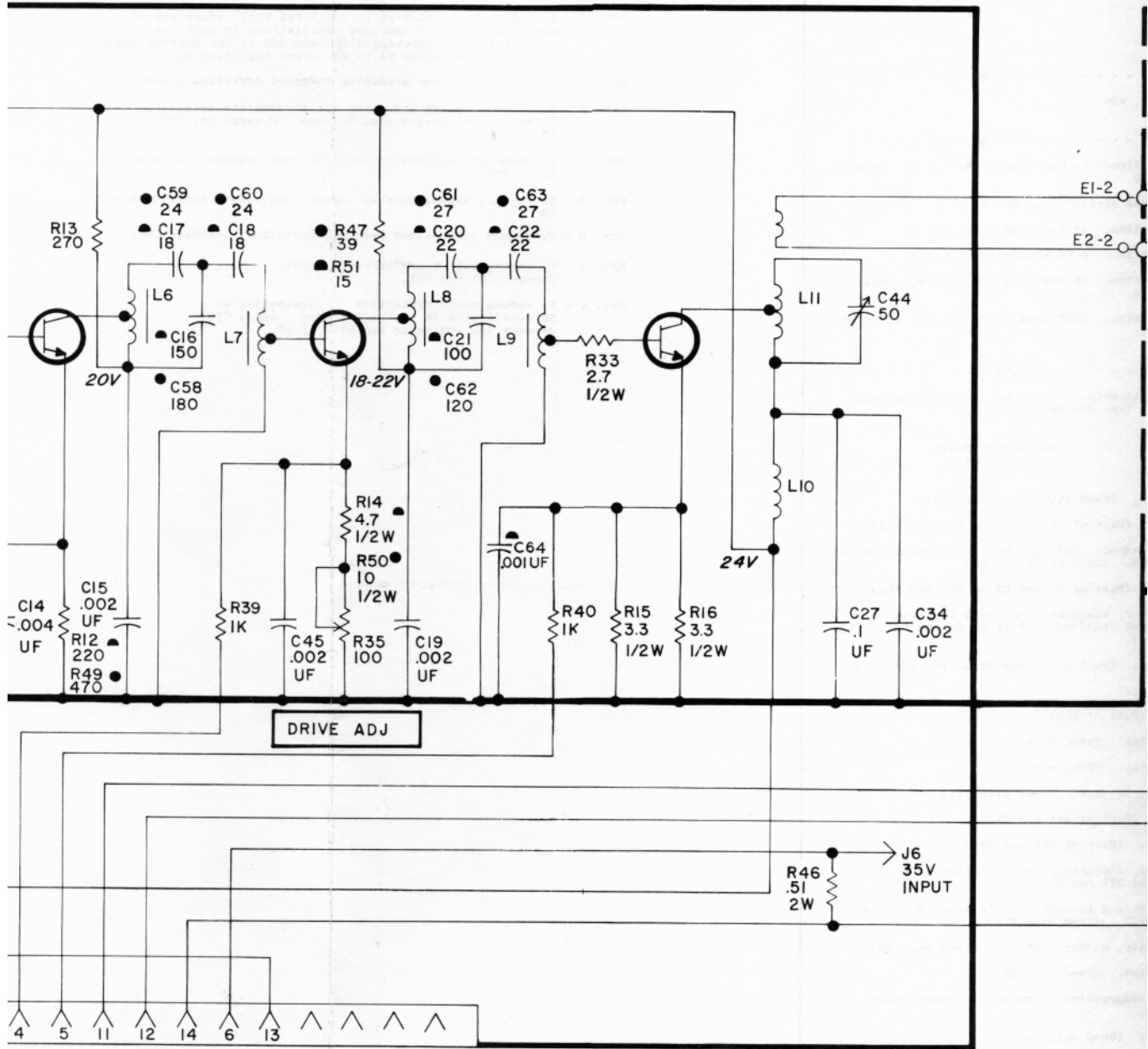
8	10	2	3	4	5
13.5 V REGULATED	MULT. 1 - 0.16V TYPICAL	MULT. 2 - 0.65V TYPICAL	MULT. 3 - 0.7V TYPICAL	GROUND	AMPL.



3RD DOUBLER  
Q4

1ST DRIVER  
Q5

2ND DRIVER  
Q6



4 5 11 12 14 6 13

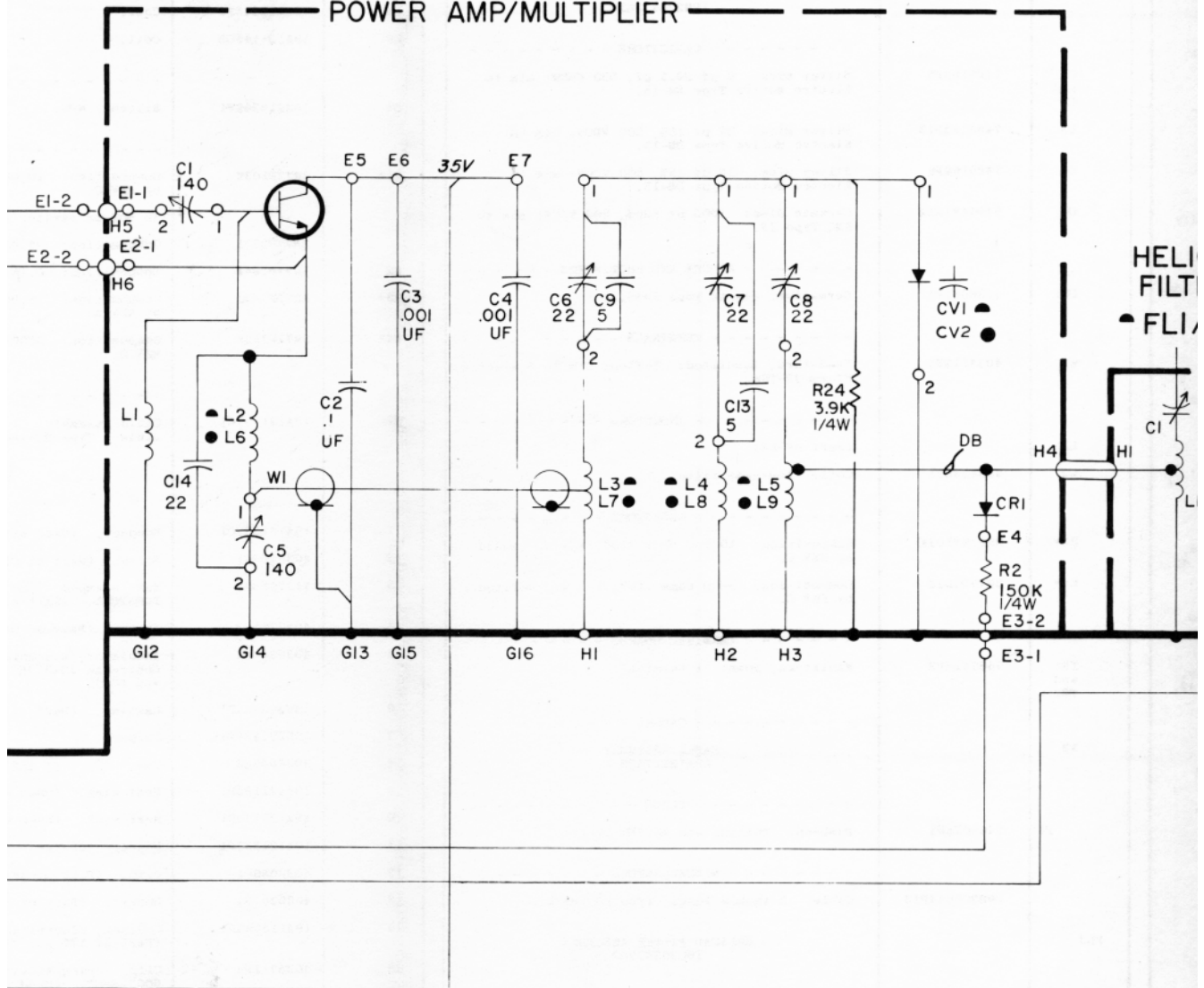
SOUND  
AMPL. 1 - 0.7V TYPICAL  
VAR. OUT  
ANT. IN  
P.A. DRIVE  
P.A. SUPPLY  
GROUND

ALL VOLTA  
READINGS  
PER-VOLT  
FOLLOWED  
MADE WITH  
AND WITH  
BATTERIES  
SUPPLIES.

POWER AMPLIFIER  
Q1

TRIPLER  
CV1/CV2

POWER AMP/MULTIPLIER



VOLTAGE READINGS

ALL VOLTAGE READINGS ARE TYPICAL READINGS MADE WITH 20,000 OHM-PER-VOLT METER EXCEPT WHERE FOLLOWED BY VTVM. ALL READINGS MADE WITH TRANSMITTER KEYPED AND WITH FRESH OR FULLY RECHARGED BATTERIES IN PORTABLE POWER SUPPLIES.

■ SINGLE FREQ ONLY.

▲ TWO FREQ ONLY.

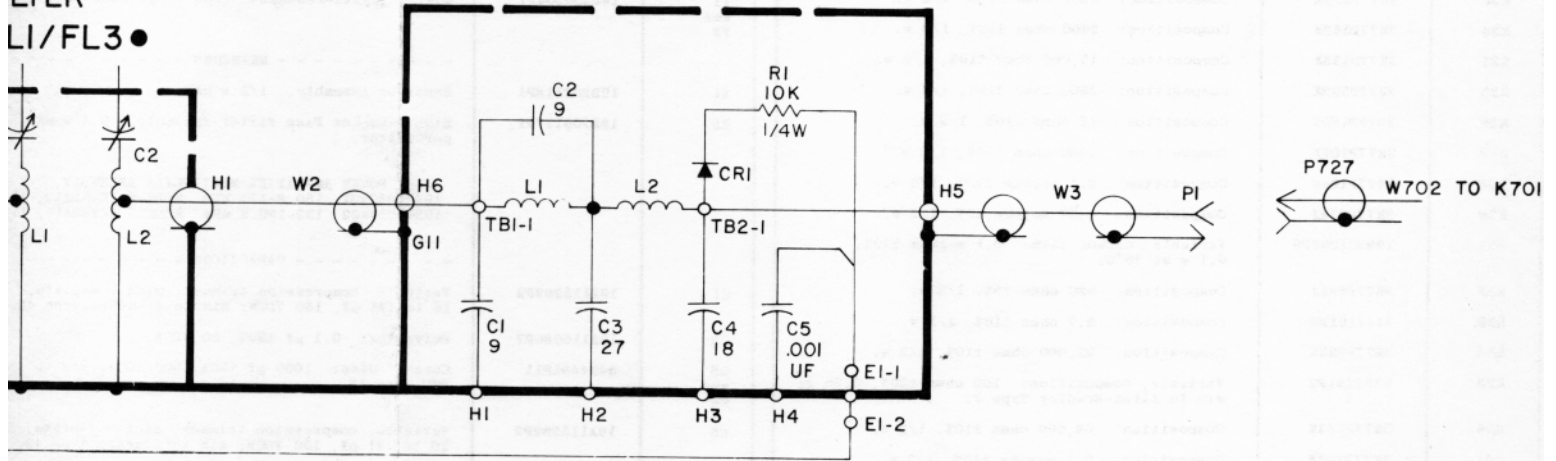
● IN 4ET62A10 & A11 ONLY.  
(130-150.8 MC)

◐ IN 4ET62A12 & A13 ONLY.  
(150.8-174 MC)

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

INDUCTIVE FILTER  
LI/FL3 ●

LOW-PASS  
FILTER  
FL2



SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
4ET62A10, 11, 12 & 13	K

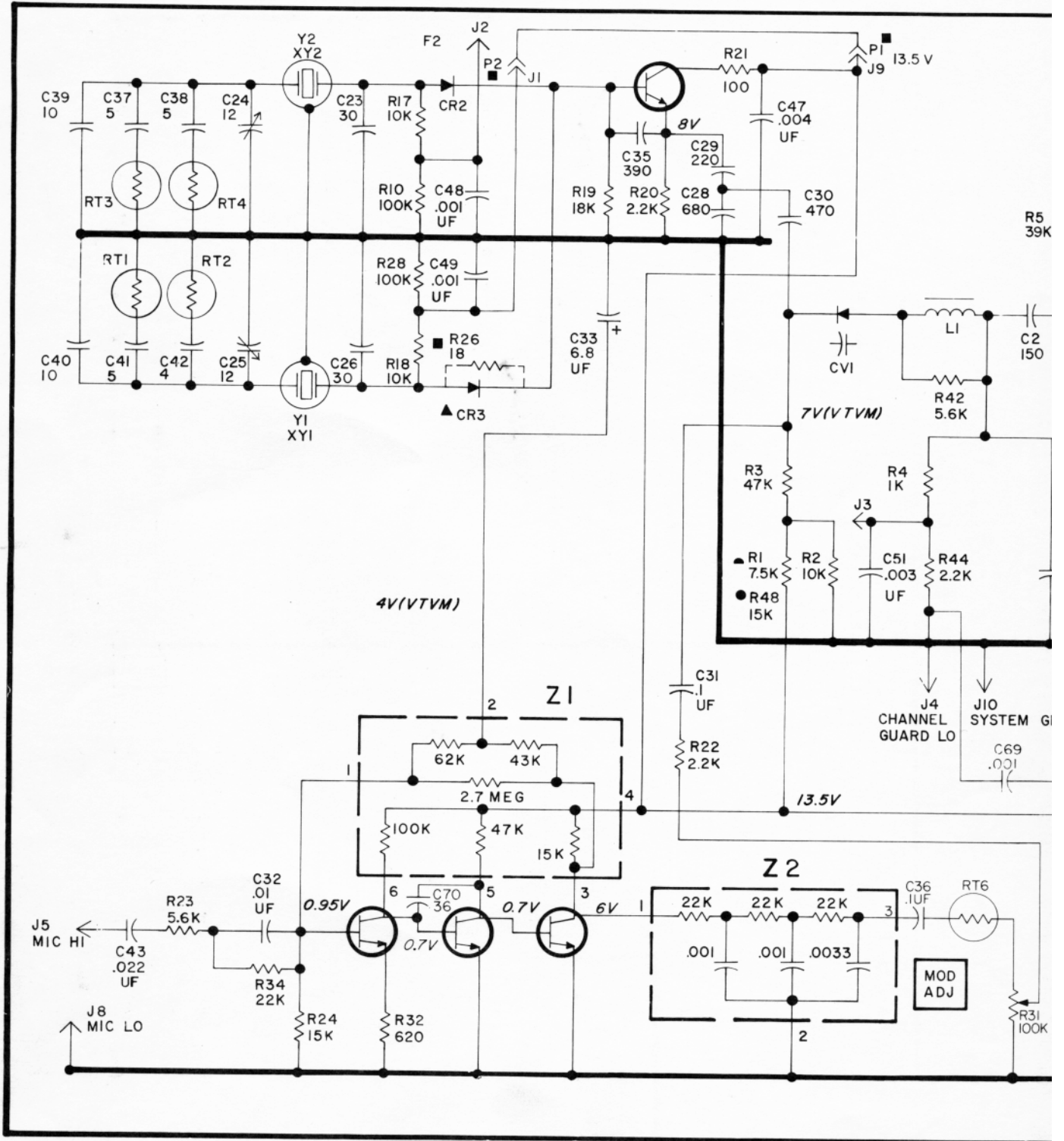
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

**SERVICE SHEET**

132—174 MHz TRANSMITTER  
MODELS 4ET62A10-13

(RC-1072M. Sheet 2)

OSCILLATOR      MODULATOR  
Q7                      CVI

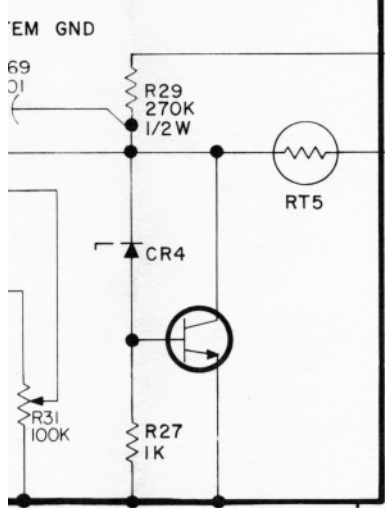
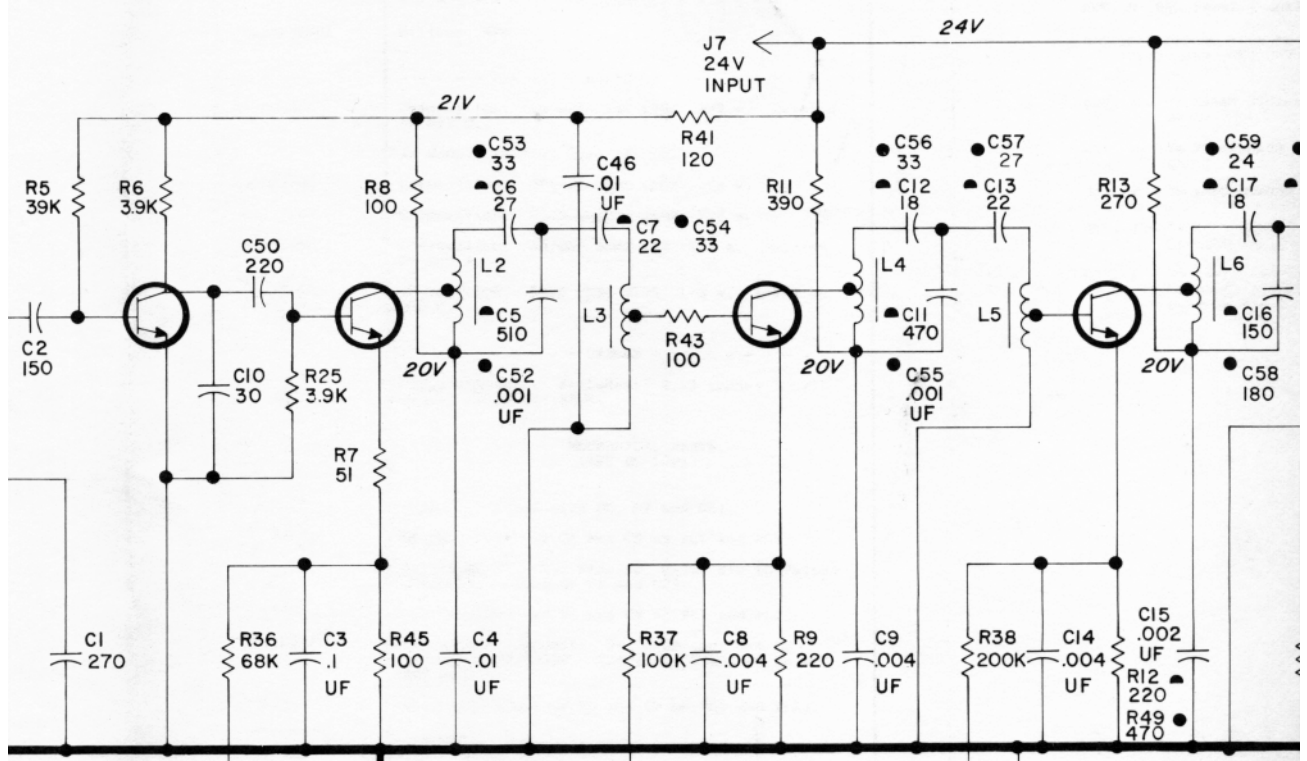


AUDIO      AUDIO      LIMITER  
Q8              Q9              Q10

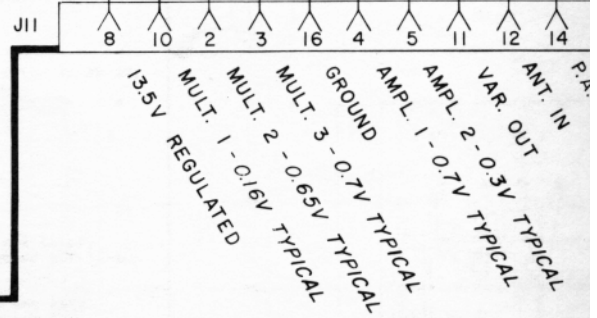


R BUFFER Q1      1ST DOUBLER Q2      2ND DOUBLER Q3      3RD DOUBLER Q4

EXCITER BOARD



CENTRALIZED METERING JACK



REGULATOR Q11



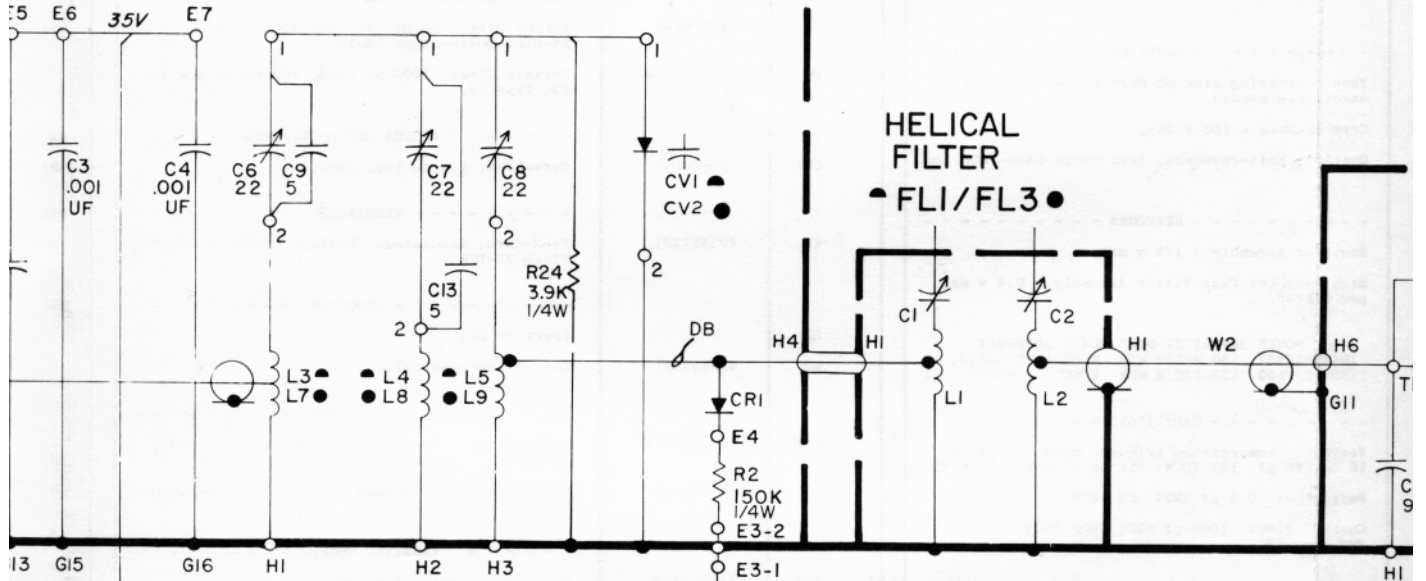
AMPLIFIER

Q1

TRIPLER

CV1 / CV2

POWER AMP/MULTIPLIER



SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER

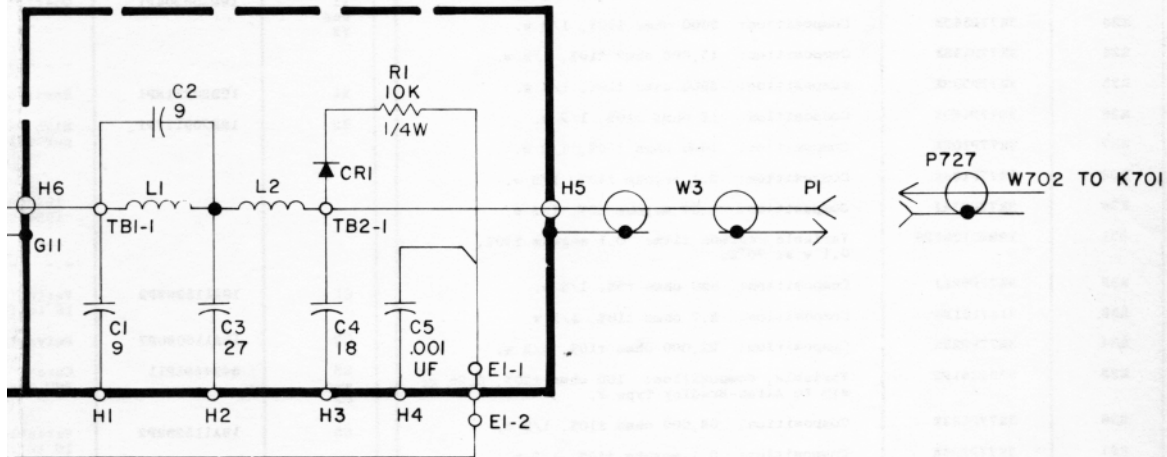
THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
4ET62A10, 11, 12 & 13	K

- SINGLE FREQ ONLY.
- ▲ TWO FREQ ONLY.
- IN 4ET62A10 & A11 ONLY. (130-150.8 MC)
- IN 4ET62A12 & A13 ONLY. (150.8-174 MC)

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

LOW-PASS  
FILTER  
FL2



CHANGE  
SECTION  
ES -  
EACH

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TO

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TER

EQUIPMENT  
NT OF ANY  
E ONLY WITH  
CIFICATIONS  
THAT PART.

**SERVICE SHEET**

132—174 MHz TRANSMITTER  
MODELS 4ET62A10-13

(RC-1072M, Sheet 2)



PARTS LIST

LBI-3485L

132-174 MHz RECEIVER MODELS 4ER44A10-13  
 132-174 MHz FIRST OSCILLATOR MODELS 4EG20A10-13

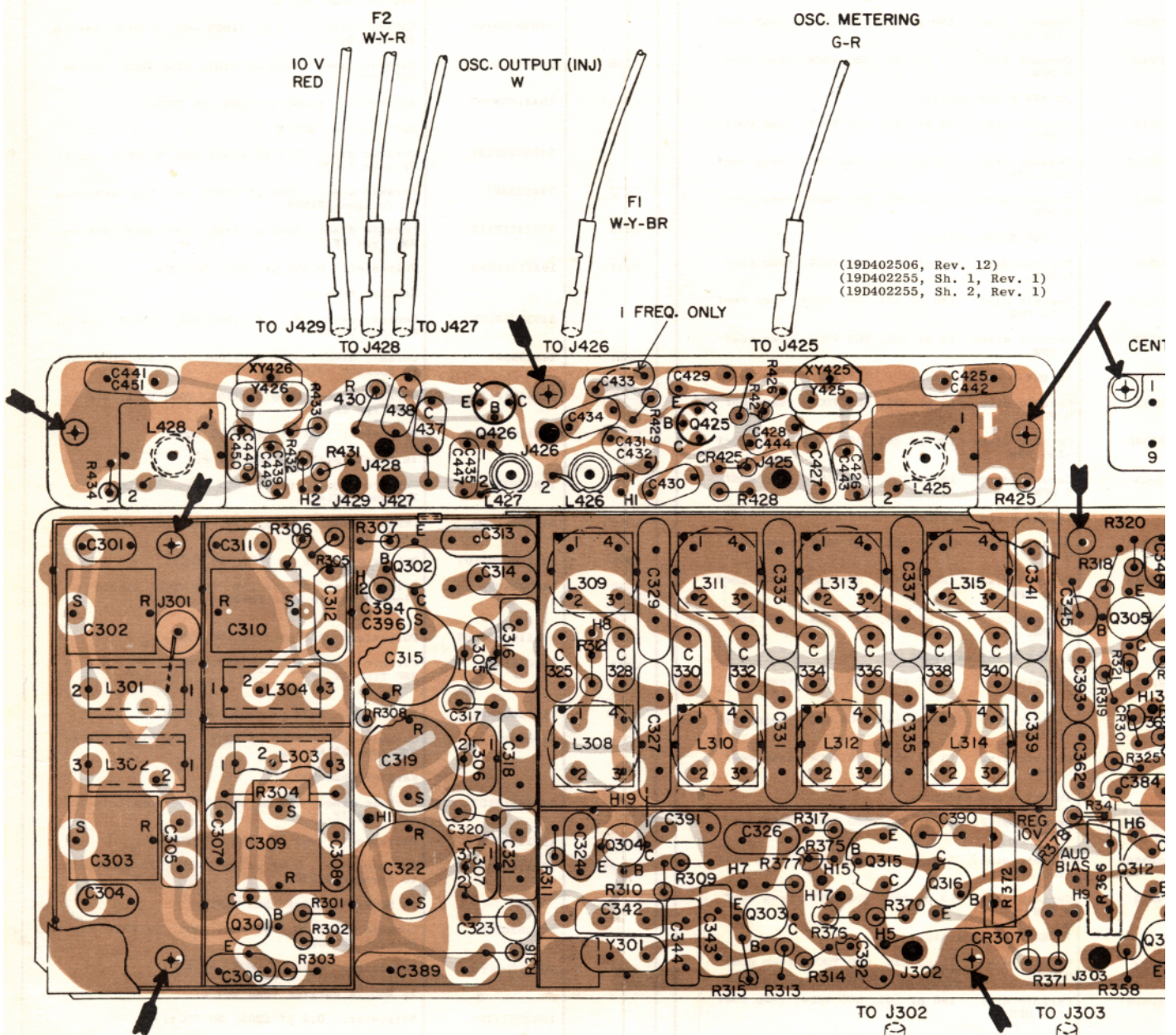
SYMBOL	GE PART NO.	DESCRIPTION
		RECEIVER ASSEMBLY MODELS 4ER44A10-13 19D402257G1
		----- CAPACITORS -----
C301	19A116656P5J8	Ceramic disc: 5 pf $\pm 0.5$ pf, 500 VDCW, temp coef -80 PPM.
C302 and C303	5491271P106	Variable, subminiature: 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C304	19A116656P5J8	Ceramic disc: 5 pf $\pm 0.5$ pf, 500 VDCW, temp coef -80 PPM.
C305	5490008P131	Silver mica: 150 pf $\pm 10\%$ , 500 VDCW; sim to Electro Motive Type DM-15.
C306*	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$ , 1000 VDCW; sim to RMC Type JF Discap.  In Models earlier than REV E:
	7491393P1	Ceramic disc: .001 $\mu$ f +100% -0%, 500 VDCW; sim to Sprague 1219C4.
C307	7491827P102	Ceramic disc: .01 $\mu$ f +80% -30%, 50 VDCW; sim to Sprague 19C180.
C308	19A116656P5J8	Ceramic disc: 5 pf $\pm 0.5$ pf, 500 VDCW, temp coef -80 PPM.
C309 and C310	5491271P106	Variable, subminiature: 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C311	19A116656P5J8	Ceramic disc: 5 pf $\pm 0.5$ pf, 500 VDCW, temp coef -80 PPM.
C312	7491393P2	Ceramic disc: .01 $\mu$ f +100% -0%, 500 VDCW.
C313*	5494481P114	Ceramic disc: 2000 pf $\pm 10\%$ , 1000 VDCW; sim to RMC Type JF Discap.  In Models of REV G and earlier:
	5494481P112	Ceramic disc: 1000 pf $\pm 10\%$ , 1000 VDCW; sim to RMC Type JF Discap.  In Models earlier than REV E:
	7491393P1	Ceramic disc: .001 $\mu$ f +100% -0%, 500 VDCW; sim to Sprague 1219C4.
C314	7491827P2	Ceramic disc: .01 $\mu$ f +80% -30%, 50 VDCW; sim to Sprague 19C180.
C315	5490446P1	Variable, ceramic: 8-50 pf, 350 VDCW, temp coef -750 PPM; sim to Erie 557-36.
C316	5490008P29	Silver mica: 120 pf $\pm 5\%$ , 500 VDCW; sim to Electro Motive Type DM-15.
C317	7130348P1	Molded: 0.47 pf $\pm 0.047$ pf, 500 VDCW, temp coef 0 PPM; sim to Jeffers Type JM-5/32.
C318	5490008P29	Silver mica: 120 pf $\pm 5\%$ , 500 VDCW; sim to Electro Motive Type DM-15.
C319	5490446P1	Variable, ceramic: 8-50 pf, 350 VDCW, temp coef -750 PPM; sim to Erie 557-36.
C320	7130348P1	Molded: 0.47 pf $\pm 0.047$ pf, 500 VDCW, temp coef 0 PPM; sim to Jeffers Type JM-5/32.
C321	5490008P29	Silver mica: 120 pf $\pm 5\%$ , 500 VDCW; sim to Electro Motive Type DM-15.
C322	5490446P1	Variable, ceramic: 8-50 pf, 350 VDCW, temp coef -750 PPM; sim to Erie 557-36.
C323	7491930P4	Polyester: .0068 $\mu$ f $\pm 20\%$ , 100 VDCW; sim to GE Type 61F.
C324*	19A116080P1	Polyester: .01 $\mu$ f $\pm 20\%$ , 50 VDCW.  In Models earlier than REV F:
	7491827P2	Ceramic disc: .01 $\mu$ f +80% -30%, 50 VDCW; sim to Sprague 19C180.

\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
C325 and C326	19A116080P107	Polyester: 0.1 $\mu$ f $\pm$ 10%, 50 VDCW.
C327	5496219P369	Ceramic disc: 180 pf $\pm$ 5%, 500 VDCW, temp coef -150 PPM.
C328*	5496219P43	Ceramic disc: 13 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.  In REV N and earlier:
	5496219P42	Ceramic disc: 12 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.
C329	5496219P369	Ceramic disc: 180 pf $\pm$ 5%, 500 VDCW, temp coef -150 PPM.
C330*	5496219P43	Ceramic disc: 13 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.  In REV N and earlier:
	5496219P42	Ceramic disc: 12 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.
C331	5496219P369	Ceramic disc: 180 pf $\pm$ 5%, 500 VDCW, temp coef -150 PPM.
C332*	5496219P43	Ceramic disc: 13 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.  In REV N and earlier:
	5496219P42	Ceramic disc: 12 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.
C333	5496219P369	Ceramic disc: 180 pf $\pm$ 5%, 500 VDCW, temp coef -150 PPM.
C334*	5496219P43	Ceramic disc: 13 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.  In REV N and earlier:
	5496219P42	Ceramic disc: 12 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.
C335	5496219P369	Ceramic disc: 180 pf $\pm$ 5%, 500 VDCW, temp coef -150 PPM.
C336*	5496219P43	Ceramic disc: 13 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.  In REV N and earlier:
	5496219P42	Ceramic disc: 12 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.
C337	5496219P369	Ceramic disc: 180 pf $\pm$ 5%, 500 VDCW, temp coef -150 PPM.
C338*	5496219P43	Ceramic disc: 13 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.  In REV N and earlier:
	5496219P42	Ceramic disc: 12 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.
C339	5496219P369	Ceramic disc: 180 pf $\pm$ 5%, 500 VDCW, temp coef -150 PPM.
C340*	5496219P43	Ceramic disc: 13 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.  In REV N and earlier:
	5496219P42	Ceramic disc: 12 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.
C341	5496219P369	Ceramic disc: 180 pf $\pm$ 5%, 500 VDCW, temp coef -150 PPM.
C342	5496219P50	Ceramic disc: 30 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.
C343	5490008P19	Silver mica: 47 pf $\pm$ 5%, 500 VDCW; sim to Electro Motive Type DM-15.
C344	5490008P23	Silver mica: 68 pf $\pm$ 5%, 500 VDCW; sim to Electro Motive Type DM-15.
C345	7491930P3	Polyester: .0047 $\mu$ f $\pm$ 20%, 100 VDCW; sim to GE Type 61F.
C346*	19A116080P3	Polyester: 0.022 $\mu$ f $\pm$ 20%, 50 VDCW.  Earlier than REV K:
	5492638P101	Ceramic disc: 0.1 $\mu$ f $\pm$ 100% -0%, 3 VDCW; sim to Sprague 54C23.
C347	5494481P112	Ceramic disc: 1000 pf $\pm$ 10%, 1000 VDCW; sim to RMC Type JF.
C348	5496219P367	Ceramic disc: 150 pf $\pm$ 5%, 500 VDCW, temp coef -150 PPM.

SYMBOL	GE PART NO.	DESCRIPTION
C349*	19A116080P3	Polyester: 0.022 $\mu$ f $\pm$ 20%, 50 VDCW. Earlier than REV K:
	5492638P101	Ceramic disc: 0.1 $\mu$ f +100% -0%, 3 VDCW; sim to Sprague 54C23.
C350	5494481P112	Ceramic disc: 1000 pf $\pm$ 10%, 1000 VDCW; sim to RMC Type JF.
C351*	19A116080P3	Polyester: 0.022 $\mu$ f $\pm$ 20%, 50 VDCW. Earlier than REV K:
	5492638P101	Ceramic disc: 0.1 $\mu$ f +100% -0%, 3 VDCW; sim to Sprague 54C23.
C352	7491393P1	Ceramic disc: .001 $\mu$ f +100% -0%, 500 VDCW; sim to Sprague 1219C4.
C353	5494481P112	Ceramic disc: 1000 pf $\pm$ 10%, 1000 VDCW; sim to RMC Type JF.
C354*	19A116080P3	Polyester: 0.022 $\mu$ f $\pm$ 20%, 50 VDCW. Earlier than REV K:
	5492638P101	Ceramic disc: 0.1 $\mu$ f +100% -0%, 3 VDCW; sim to Sprague 54C23.
C355	7491393P1	Ceramic disc: .001 $\mu$ f +100% -0%, 500 VDCW; sim to Sprague 1219C4.
C356	5494481P112	Ceramic disc: 1000 pf $\pm$ 10%, 1000 VDCW; sim to RMC Type JF.
C357*	19A116080P1	Polyester: .01 $\mu$ f $\pm$ 20%, 50 VDCW. In Models earlier than REV E:
	7491827P2	Ceramic disc: .01 $\mu$ f +80% -30%, 50 VDCW; sim to Sprague 19C180.
C358	5496219P369	Ceramic disc: 180 pf $\pm$ 5%, 500 VDCW, temp coef -150 PPM.
C359	19A116080P107	Polyester: 0.1 $\mu$ f $\pm$ 10%, 50 VDCW.
C360 and C361	5490008P37	Silver mica: 270 pf $\pm$ 5%, 500 VDCW; sim to Electro Motive Type DM-15.
C362	19A116080P107	Polyester: 0.1 $\mu$ f $\pm$ 10%, 50 VDCW.
C363 and C364	5494481P111	Ceramic disc: 1000 pf $\pm$ 20%, 1000 VDCW; sim to RMC Type JF.
C365	19A116080P109	Polyester: 0.22 $\mu$ f $\pm$ 10%, 50 VDCW.
C366*	5494481P11	Ceramic disc: 1000 pf $\pm$ 20%, 1000 VDCW; sim to RMC Type JF Discap. Earlier than REV J:
	5494481P107	Ceramic disc: 470 pf $\pm$ 20%, 1000 VDCW; sim to RMC Type JF.
C367	19A116080P5	Polyester: .047 $\mu$ f $\pm$ 20%, 50 VDCW.
C368*	19A116080P109	Ceramic disc: 0.22 $\mu$ f +80% -20%, 12 VDCW; sim to Sprague 44C70. In Models earlier than REV C:
	5492638P107	Ceramic disc: 0.1 $\mu$ f +80% -20%, 12 VDCW; sim to Sprague 20C202.
C369*	19A116080P8	Polyester: 0.15 $\mu$ f $\pm$ 20%, 50 VDCW. In Models earlier than REV C:
	19B209243P7	Polyester: 0.1 $\mu$ f $\pm$ 20%, 50 VDCW.
C370	19A116080P7	Polyester: 0.1 $\mu$ f $\pm$ 20%, 50 VDCW.
C371	19A116080P109	Polyester: 0.22 $\mu$ f $\pm$ 10%, 50 VDCW.
C372	5495670P3	Electrolytic: 5 $\mu$ f +75% -10%, 6 VDCW; sim to Sprague 30D.
C373*	5494481P114	Ceramic disc: 2000 pf $\pm$ 10%, 1000 VDCW; sim to RMC Type JF. Deleted by REV C.
C374	5496267P2	Tantalum: 47 $\mu$ f $\pm$ 20%, 6 VDCW; sim to Sprague 150D.
C375*	19A116080P5	Polyester: .047 $\mu$ f $\pm$ 20%, 50 VDCW. In Models earlier than REV C:
	19B209243P5	Polyester: .068 $\mu$ f $\pm$ 20%, 50 VDCW.
C376	19A116080P109	Polyester: 0.22 $\mu$ f $\pm$ 10%, 50 VDCW.





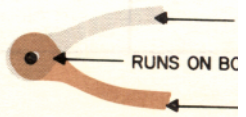
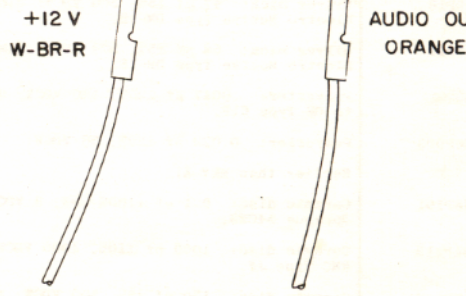
(19D402506, Rev. 12)  
 (19D402255, Sh. 1, Rev. 1)  
 (19D402255, Sh. 2, Rev. 1)

RESISTANCE READINGS  
 RESISTANCE READINGS ARE TYPICAL READINGS  
 MEASURED TO J312-13 (GROUND), AND WITH  
 ALL POWER REMOVED FROM THE CHASSIS.

**SERVICE SHEET**

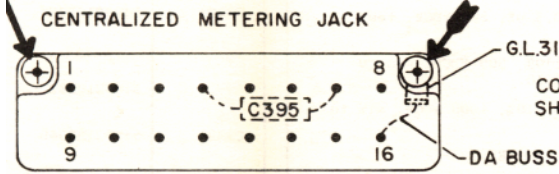
132—150.8 MHZ RECEIVER  
 MODEL 4ER44A10 (1-Freq)  
 MODEL 4ER44A11 (2-Freq)  
 150.8—174 MHZ RECEIVER  
 MODEL 4ER44A12 (1-Freq)  
 MODEL 4ER44A13 (2-Freq)

(RC-1073N, Sheet 1)

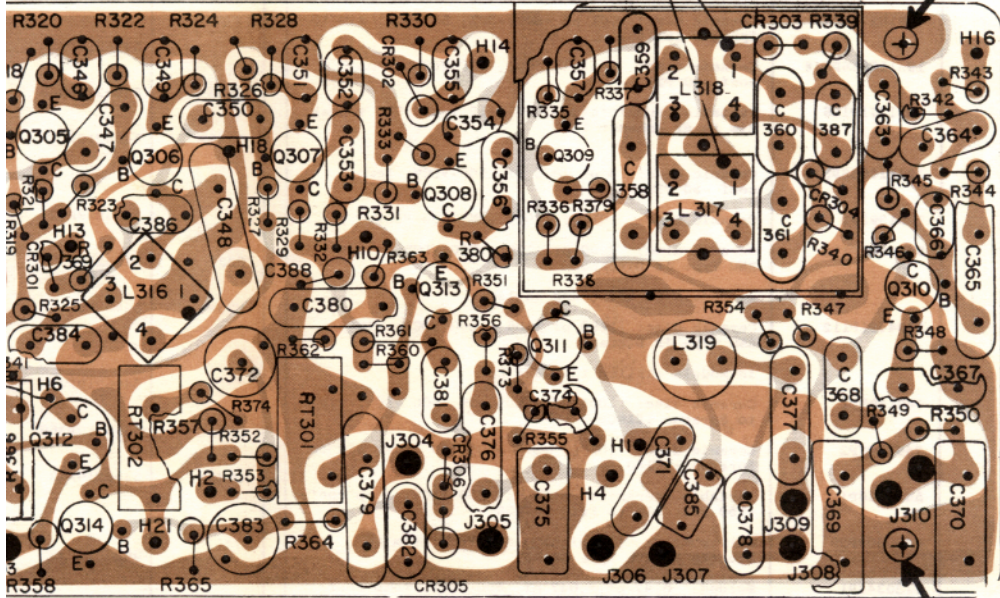




# J312

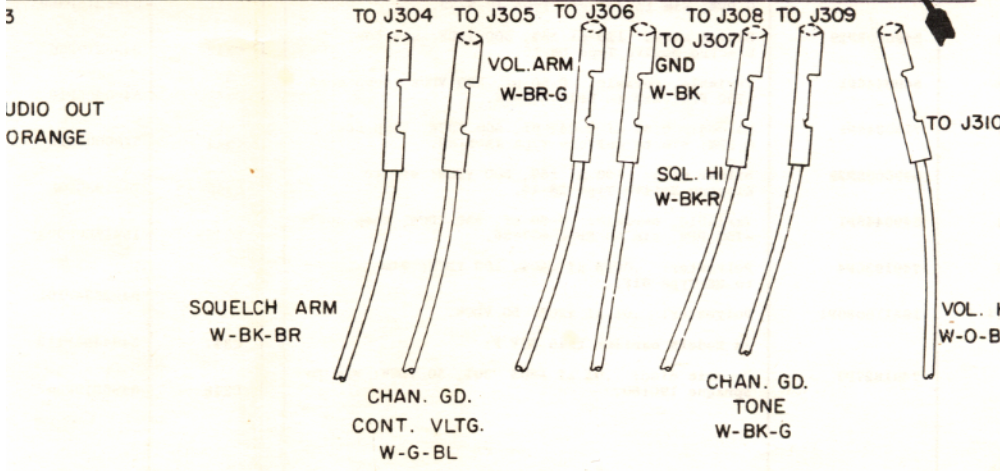
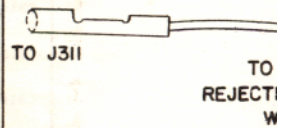


TO REMOVE REC FROM SHIELD RE ARROWS. ALSO BLACK SLEEVED J312.



MEASURED FROM
* J302
J305
J312-2
J312-3
J312-4
J312-9
J312-10

\* MEASURED P712 (+ 12V)



← RUNS ON SOLDER SIDE  
 ← RUNS ON BOTH SIDES  
 ← RUNS ON COMPONENT SIDE

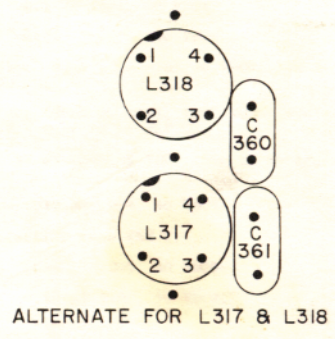
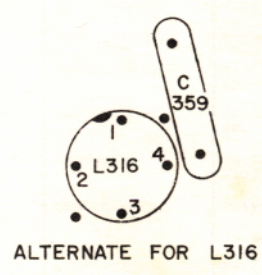
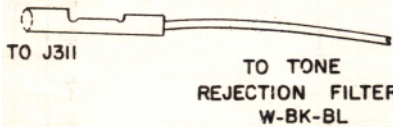
(19D402506, Rev. 16)  
 (19C303403, Sh. 1, Rev. 9)  
 (19C303403, Sh. 2, Rev. 9)



TO REMOVE RECEIVER AND OSCILLATOR BOARDS FROM SHIELD REMOVE SCREWS SHOWN BY ARROWS. ALSO DISCONNECT GREEN AND BLACK SLEEVED INLINE CONNECTORS BEHIND J312.

MEASURED FROM	NEGATIVE (-) PROBE TO GND	POSITIVE (+) PROBE TO GND
* J302	5.5K	4K
J305	11K	1.8K
J312-2	1 MEG OHM	60K
J312-3	1 MEG OHM	60K
J312-4	2 MEG OHMS	6.8K
J312-9	1Ω (HI) 8Ω (LO)	1Ω (HI) 8Ω (LO)
J312-10	150K	150K

\* MEASURED WITH POWER SUPPLY LEAD P712 (+ 12V) DISCONNECTED.



11  
2



SYMBOL	GE PART NO.	DESCRIPTION
C377	5494481P116	Ceramic disc: 3000 pf $\pm 10\%$ , 1000 VDCW; sim to RMC Type JF.
C378	5494481P112	Ceramic disc: 1000 pf $\pm 10\%$ , 1000 VDCW; sim to RMC Type JF.
C379	7491827P5	Ceramic disc: 0.1 $\mu$ f $+80\%$ $-30\%$ , 50 VDCW; sim to Sprague 36C172.
C380	19A116080P109	Polyester: 0.22 $\mu$ f $\pm 10\%$ , 50 VDCW.
C381*	19A116080P1	Polyester: .01 $\mu$ f $\pm 20\%$ , 50 VDCW. In Models earlier than REV E:
	7491827P2	Ceramic disc: .01 $\mu$ f $+80\%$ $-30\%$ , 50 VDCW; sim to Sprague 19C180.
C382	19A116080P107	Polyester: 0.1 $\mu$ f $\pm 10\%$ , 50 VDCW.
C383	5495670P13	Electrolytic: 2 $\mu$ f $+75\%$ $-10\%$ , 25 VDCW; sim to Sprague 30D.
C384	19A116080P107	Polyester: 0.1 $\mu$ f $\pm 10\%$ , 50 VDCW.
C385	19A116080P201	Polyester: 0.01 $\mu$ f $\pm 5\%$ , 50 VDCW.
C386	5496203P117	Ceramic disc: 47 pf $\pm 10\%$ , 500 VDCW, temp coef $-3300$ PPM.
C387	5496219P656	Ceramic disc: 51 pf $\pm 5\%$ , 500 VDCW, temp coef $-470$ PPM.
C388	5496267P10	Tantalum: 22 $\mu$ f $\pm 20\%$ , 15 VDCW; sim to Sprague 150D.
C389	19A116080P7	Polyester: 0.1 $\mu$ f $\pm 20\%$ , 50 VDCW.
C390	5496267P10	Tantalum: 22 $\mu$ f $\pm 20\%$ , 15 VDCW; sim to Sprague 150D.
C391	5490008P11	Silver mica: 22 pf $\pm 5\%$ , 500 VDCW; sim to Electro Motive Type DM-15.
C392*	19A116080P1	Polyester: .01 $\mu$ f $\pm 20\%$ , 50 VDCW. In Models earlier than REV F:
	7491827P2	Ceramic disc: .01 $\mu$ f $+80\%$ $-30\%$ , 50 VDCW; sim to Sprague 19C180.
C393	5496219P817	Ceramic disc: 47 pf $\pm 10\%$ , 500 VDCW, temp coef $-150$ PPM.
C394*	7130348P1	Molded: 0.47 pf $\pm 0.047$ pf, 500 VDCW, temp coef 0 PPM. Added by REV B.
C395*	7489162P111	Mica: 22 pf $\pm 10\%$ , 500 VDCW; sim to Electro Motive Type DM-15. Added by REV B.
C396*	7130348P3	Molded: 1 pf $\pm 0.05\%$ , 500 VDCW, temp coef 0 PPM. Added by REV B.
C397*	7489162P139	Silver mica: 330 pf $\pm 10\%$ , 500 VDCW; sim to Electro Motive Type DM-15. Added by REV D. Deleted by REV M.
		----- DIODES AND RECTIFIERS -----
CR301 and CR302	4038056P1	Germanium.
CR303 and CR304	19A115250P1	Silicon.
CR305 and CR306	4038056P1	Germanium.
CR307	4036887P6	Silicon, Zener.
CR308*	4036887P3	Silicon, Zener. Deleted by REV M.
		----- JACKS AND RECEPTACLES -----
J301	5496078P3	Receptacle, push-on: Teflon; sim to FXR 27-3.
J302 thru J311	4033513P4	Pin, contact: sim to Bead Chain L93-3.
J312	19B205689G2	Connector: 18 contacts.
		----- INDUCTORS -----
L301	19B204402G4	Coil Assembly.
L302	19B204402G1	Coil Assembly.
L303*	19B204402G3	Coil Assembly. In Models earlier than REV E:
	19B204402G2	Coil Assembly.

SYMBOL	G-E PART NO	DESCRIPTION
L304	19B204402G3	Coil Assembly.
L305 and L306	19B204403G1	Coil Assembly.
L307	19B204403G2	Coil Assembly.
L308* thru L315*	19A115711P1	Freq: 455 KHz; sim to Automatic Mfg EX12670.  Earlier than REV L: Coil Assembly. Includes tuning slug 4038368P1.
L316*	19A115711P2	Freq: 455 KHz; sim to Automatic Mfg EX12671.  Earlier than REV L: Coil Assembly. Includes tuning slug 4038368P1.
L317*	19A115711P6	Freq: 455 KHz; sim to Toko PEFCN-14733CX12.  Earlier than REV L: Coil Assembly. Includes tuning slug 4038368P1.
L318*	19A115711P7	Freq: 455 KHz; sim to Toko PEFCN-14734BNL2.  Earlier than REV L: Coil Assembly. Includes tuning slug 4038368P1.
L319	5491736P2	Inductor: 240 mh $\pm 10\%$ ind at 0.5 v, 270 ohms max DC res; sim to Aladdin 33-161.
P301 thru P303	4029840P2	----- PLUGS ----- Contact, electrical; sim to Amp 42827-2.
P304 and P305	7147199P1	Connector: 1 male contact; sim to Winchester Electronics 21803.  ----- TRANSISTORS -----
Q301 and Q302	19A115342P1	Silicon, NPN.
Q303	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q304	19A115342P1	Silicon, NPN.
Q305* and Q306*	19A116774P1	Silicon, NPN; sim to Type 2N5210.  In REV R and earlier: Silicon, NPN; sim to Type 2N2712.
Q307 thru Q309	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q310*	19A116774P1	Silicon, NPN; sim to Type 2N5210.  In REV N and earlier: Silicon, NPN; sim to Type 2N2712.
Q311*	19A116755P1	Silicon, NPN; sim to Type 2N3947.  In REV R and earlier: Silicon, NPN; sim to Type 2N2712.
Q312	19A115300P4	Silicon, NPN; sim to Type 2N3053.
Q313*	19A116774P1	Silicon, NPN; sim to Type 2N5210.  In REV N and earlier: Silicon, NPN; sim to Type 2N2712.
Q314*	19A116755P1	Silicon, NPN; sim to Type 2N3947.  In REV R and earlier: Silicon, NPN; sim to Type 2N2712.
Q315	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q316*	19A116755P1	Silicon, NPN; sim to Type 2N3947.  In REV R and earlier: Silicon, NPN; sim to Type 2N2712.
R301	3R77P392K	----- RESISTORS ----- Composition: 3900 ohms $\pm 10\%$ , 1/2 w.
R302	3R77P153K	Composition: 15,000 ohms $\pm 10\%$ , 1/2 w.
R303	3R77P102K	Composition: 1000 ohms $\pm 10\%$ , 1/2 w.
R304	3R152P331K	Composition: 330 ohms $\pm 10\%$ , 1/4 w.
R305	3R77P473K	Composition: 47,000 ohms $\pm 10\%$ , 1/2 w.

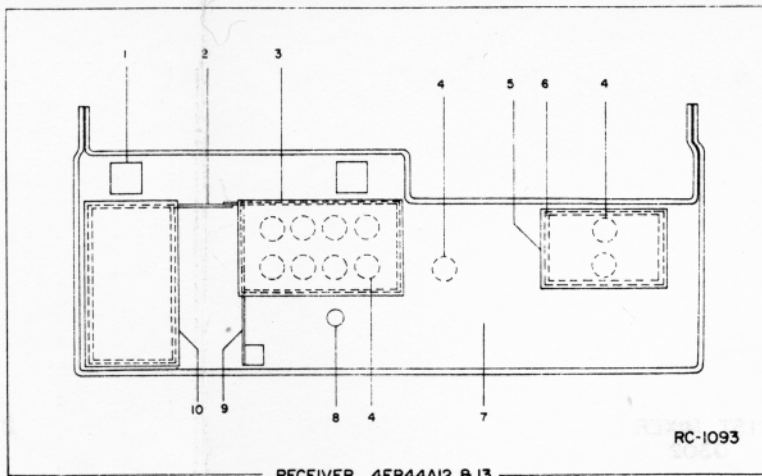
SYMBOL	G-E PART NO	DESCRIPTION
R306	3R77P154K	Composition: 0.15 megohm $\pm 10\%$ , 1/2 w.
R307	3R77P751J	Composition: 750 ohms $\pm 5\%$ , 1/2 w.
R308	3R152P331K	Composition: 330 ohms $\pm 10\%$ , 1/4 w.
R309	3R77P473K	Composition: 47,000 ohms $\pm 10\%$ , 1/2 w.
R310	3R77P154K	Composition: 0.15 megohm $\pm 10\%$ , 1/2 w.
R311	3R77P751J	Composition: 750 ohms $\pm 5\%$ , 1/2 w.
R312	3R77P331K	Composition: 330 ohms $\pm 10\%$ , 1/2 w.
R313 and R314	3R77P103K	Composition: 10,000 ohms $\pm 10\%$ , 1/2 w.
R315	3R77P392K	Composition: 3900 ohms $\pm 10\%$ , 1/2 w.
R316	3R77P331K	Composition: 330 ohms $\pm 10\%$ , 1/2 w.
R317	3R77P101K	Composition: 100 ohms $\pm 10\%$ , 1/2 w.
R318	3R77P103K	Composition: 10,000 ohms $\pm 10\%$ , 1/2 w.
R319	3R77P333K	Composition: 33,000 ohms $\pm 10\%$ , 1/2 w.
R320	3R77P202J	Composition: 2000 ohms $\pm 5\%$ , 1/2 w.
R321	3R77P512J	Composition: 5100 ohms $\pm 5\%$ , 1/2 w.
R322	3R77P103K	Composition: 10,000 ohms $\pm 10\%$ , 1/2 w.
R323	3R77P333K	Composition: 33,000 ohms $\pm 10\%$ , 1/2 w.
R324	3R77P202J	Composition: 2000 ohms $\pm 5\%$ , 1/2 w.
R325	3R77P102K	Composition: 1000 ohms $\pm 10\%$ , 1/2 w.
R326	3R77P103K	Composition: 10,000 ohms $\pm 10\%$ , 1/2 w.
R327	3R77P333K	Composition: 33,000 ohms $\pm 10\%$ , 1/2 w.
R328	3R77P202J	Composition: 2000 ohms $\pm 5\%$ , 1/2 w.
R329	3R77P512J	Composition: 5100 ohms $\pm 5\%$ , 1/2 w.
R330	3R77P513J	Composition: 51,000 ohms $\pm 5\%$ , 1/2 w.
R331	3R77P103K	Composition: 10,000 ohms $\pm 10\%$ , 1/2 w.
R332	3R77P333K	Composition: 33,000 ohms $\pm 10\%$ , 1/2 w.
R333	3R77P202J	Composition: 2000 ohms $\pm 5\%$ , 1/2 w.
R335	3R77P103K	Composition: 10,000 ohms $\pm 10\%$ , 1/2 w.
R336	3R77P333K	Composition: 33,000 ohms $\pm 10\%$ , 1/2 w.
R337	3R77P102J	Composition: 1000 ohms $\pm 5\%$ , 1/2 w.
R338	3R77P331K	Composition: 330 ohms $\pm 10\%$ , 1/2 w.
R339 and R340	3R77P513J	Composition: 51,000 ohms $\pm 5\%$ , 1/2 w.
R341	3R152P681K	Composition: 680 ohms $\pm 10\%$ , 1/4 w.
R342	3R77P682K	Composition: 6800 ohms $\pm 10\%$ , 1/2 w.
R343	3R77P104K	Composition: 0.1 megohm $\pm 10\%$ , 1/2 w.
R344*	3R77P103J	Composition: 10,000 ohms $\pm 5\%$ , 1/2 w.
	3R77P153K	In REV R and earlier: Composition: 15,000 ohms $\pm 10\%$ , 1/2 w.
R345	3R77P332K	Composition: 3300 ohms $\pm 10\%$ , 1/2 w.
R346	3R77P333K	Composition: 33,000 ohms $\pm 10\%$ , 1/2 w.
R347	3R77P332K	Composition: 3300 ohms $\pm 10\%$ , 1/2 w.
R348	3R77P221K	Composition: 220 ohms $\pm 10\%$ , 1/2 w.
R349	3R77P332J	Composition: 3300 ohms $\pm 5\%$ , 1/2 w.
R350	3R77P152J	Composition: 1500 ohms $\pm 5\%$ , 1/2 w.
R351	3R77P752J	Composition: 7500 ohms $\pm 5\%$ , 1/2 w.
R352 and R353	3R77P472K	Composition: 4700 ohms $\pm 10\%$ , 1/2 w.
R354*	3R77P332K	Composition: 3300 ohms $\pm 10\%$ , 1/4 w.
		In Models earlier than REV C:
	3R152P222K	Composition: 2200 ohms $\pm 10\%$ , 1/4 w.
R355*	3R77P621J	Composition: 620 ohms $\pm 5\%$ , 1/2 w.
		In Models earlier than REV C:
	3R152P431J	Composition: 430 ohms $\pm 5\%$ , 1/4 w.



SYMBOL	G-E PART NO	DESCRIPTION
R356	3R77P431J	Composition: 430 ohms $\pm 5\%$ , 1/2 w.
R357	3R77P622J	Composition: 6200 ohms $\pm 5\%$ , 1/2 w.
R358	3R77P331K	Composition: 330 ohms $\pm 10\%$ , 1/2 w.
R359*	3R152P104J	Composition: 0.1 megohm $\pm 5\%$ , 1/4 w. Deleted by REV E.
R360*	3R77P823J	Composition: 82,000 ohms $\pm 5\%$ , 1/2 w. In Models earlier than REV E:
	3R152P753J	Composition: 75,000 ohms $\pm 5\%$ , 1/4 w.
R361	3R77P332J	Composition: 3300 ohms $\pm 5\%$ , 1/2 w.
R362	3R77P222J	Composition: 2200 ohms $\pm 5\%$ , 1/2 w.
R363	3R77P153J	Composition: 15,000 ohms $\pm 5\%$ , 1/2 w.
R364	3R77P472K	Composition: 4700 ohms $\pm 10\%$ , 1/2 w.
R365	3R77P243J	Composition: 2400 ohms $\pm 5\%$ , 1/2 w.
R366*	19B209358P108	Variable, carbon film: approx 100 to 50,000 ohms $\pm 10\%$ , 0.25 w; sim to CTS Type X-201. Earlier than REV L:
	19B204808G1	Resistor Assembly. Includes resistor, variable, carbon film: 50,000 ohms $\pm 20\%$ , 0.1 w.
R369	3R77P513J	Composition: 51,000 ohms $\pm 5\%$ , 1/2 w.
R370	3R77P102J	Composition: 1000 ohms $\pm 5\%$ , 1/2 w.
R371	3R77P202J	Composition: 2000 ohms $\pm 5\%$ , 1/2 w.
R372*	19B209358P106	Variable, carbon film: approx 75 to 10,000 ohms $\pm 10\%$ , 0.25 w; sim to CTS Type X-201. Earlier than REV L:
	19B204808G2	Resistor Assembly. Includes resistor, variable, carbon film: .01 megohm $\pm 20\%$ , 0.1 w.
R373	3R77P300J	Composition: 30 ohms $\pm 5\%$ , 1/2 w.
R374	3R77P472J	Composition: 4700 ohms $\pm 5\%$ , 1/2 w.
R375 and R376	19A116278P444	Metal film: 0.28 megohm $\pm 2\%$ , 1/2 w.
R377	3R77P331K	Composition: 330 ohms $\pm 10\%$ , 1/2 w.
R378	3R152P101K	Composition: 100 ohms $\pm 10\%$ , 1/4 w.
R379*	3R152P511J	Composition: 510 ohms $\pm 5\%$ , 1/4 w. Added by REV N.
R380*	3R152P512J	Composition: 5100 ohms $\pm 5\%$ , 1/4 w. Added by REV M.
- - - - - THERMISTORS - - - - -		
RT301	5490828P29	Rod: 0.228 megohm $\pm 5\%$ res at 25°C, 1 w max input at 40°C; sim to Globar 723B-1.
RT302	5490828P28	Rod: 8750 ohms $\pm 5\%$ res at 25°C, 1 w max input at 40°C; sim to Globar 723F-2.
- - - - - CRYSTALS - - - - -		
Y301	19A110215G1	Quartz: anti-resonant, freq 10245 KHz.
FIRST OSCILLATOR ASSEMBLY MODELS 4EG20A10-13 19D402259G3 - Single Freq 132-150.8 MHz 19D402259G4 - Two Freq 132-150.8 MHz 19D402259G1 - Single Freq 150.8-174 MHz 19D402259G2 - Two Freq 150.8-174 MHz		
- - - - - CAPACITORS - - - - -		
C425	5496219P56	Ceramic disc: 51 pf $\pm 5\%$ , 500 VDCW, temp coef 0 PPM.
C426	5496219P244	Ceramic disc: 15 pf $\pm 5\%$ , 500 VDCW, temp coef -80 PPM.
C427	7491393P1	Ceramic disc: .001 $\mu$ f +100% -0%, 500 VDCW; sim to Sprague 1219C4.
C428	5496219P37	Ceramic disc: 6 pf $\pm 0.25$ pf, 500 VDCW, temp coef 0 PPM.
C429*	5494481P112	Ceramic disc: 1000 pf $\pm 10\%$ , 1000 VDCW; sim to RMC Type JF Discap.
	7491393P1	In Models of REV B and earlier: Ceramic disc: .001 $\mu$ f +100% -0%, 500 VDCW; sim to Sprague 1219C4.

SYMBOL	G-E PART NO	DESCRIPTION
C430	5496219P34	Ceramic disc: 3 pf $\pm$ 0.25 pf, 500 VDCW, temp coef 0 PPM.
C431	5496219P241	Ceramic disc: 10 pf $\pm$ 0.25 pf, 500 VDCW, temp coef -80 PPM.
C432	5496219P240	Ceramic disc: 9 pf $\pm$ 0.25 pf, 500 VDCW, temp coef -80 PPM.
C433*	5494481P112	Ceramic disc: 1000 pf $\pm$ 10%, 1000 VDCW; sim to RMC Type JF Discap.
	7491393P1	In Models of REV B and earlier: Ceramic disc: .001 $\mu$ f +100% -0%, 500 VDCW; sim to Sprague 1219C4.
C434*	5496219P37	Ceramic disc: 6 pf $\pm$ 0.25 pf, 500 VDCW, temp coef 0 PPM.
	5496219P34	In Models of REV B and earlier: Ceramic disc: 3 pf $\pm$ 0.25 pf, 500 VDCW, temp coef 0 PPM.
C435*	5496219P235	Ceramic disc: 4 pf $\pm$ 0.25 pf, 500 VDCW, temp coef -80 PPM.
	5496219P236	In Models earlier than REV A: Ceramic disc: 5 pf $\pm$ 0.25 pf, 500 VDCW, temp coef -80 PPM.
C436*	7130348P1	Molded: 0.47 pf $\pm$ 0.047 pf, 500 VDCW, temp coef 0 PPM; sim to Jeffers Type JM-5/32. Deleted by REV A.
C437*	5496219P37	Ceramic disc: 6 pf $\pm$ 0.25 pf, 500 VDCW, temp coef 0 PPM.
	5496219P34	In Models of REV B and earlier: Ceramic disc: 3 pf $\pm$ 0.25 pf, 500 VDCW, temp coef 0 PPM.
C438*	5494481P112	Ceramic disc: 1000 pf $\pm$ 10%, 1000 VDCW; sim to RMC Type JF Discap.
	7491393P1	In Models of REV B and earlier: Ceramic disc: .001 $\mu$ f +100% -0%, 500 VDCW; sim to Sprague 1219C4.
C439	5496219P37	Ceramic disc: 6 pf $\pm$ 0.25 pf, 500 VDCW, temp coef 0 PPM.
C440	5496219P244	Ceramic disc: 15 pf $\pm$ 5%, 500 VDCW, temp coef -80 PPM.
C441	5496219P56	Ceramic disc: 51 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.
C442	5496219P257	Ceramic disc: 56 pf $\pm$ 5%, 500 VDCW, temp coef -80 PPM.
C443	5496219P245	Ceramic disc: 18 pf $\pm$ 5%, 500 VDCW, temp coef -80 PPM.
C444*	5496219P37	Ceramic disc: 6 pf $\pm$ 0.25 pf, 500 VDCW, temp coef -0 PPM.
	5496219P39	In Models of REV B and earlier: Ceramic disc: 8 pf $\pm$ 0.25 pf, 500 VDCW, temp coef -0 PPM.
C445 and C446	5496219P244	Ceramic disc: 15 pf $\pm$ 5%, 500 VDCW, temp coef -80 PPM.
C447*	5496219P237	Ceramic disc: 6 pf $\pm$ 0.25 pf, 500 VDCW, temp coef -80 PPM.
	5496219P238	In Models earlier than REV A: Ceramic disc: 7 pf $\pm$ 0.25 pf, 500 VDCW, temp coef -80 PPM.
C448*	7130348P3	Molded: 1 pf $\pm$ 0.05 pf, 500 VDCW, temp coef 0 PPM; sim to Jeffers Type JM-5/32. Deleted by REV A.
C449*	5496219P37	Ceramic disc: 6 pf $\pm$ 0.25 pf, 500 VDCW, temp coef -0 PPM.
	5496219P39	In Models of REV B and earlier: Ceramic disc: 8 pf $\pm$ 0.25 pf, 500 VDCW, temp coef 0 PPM.
C450	5496219P245	Ceramic disc: 18 pf $\pm$ 5%, 500 VDCW, temp coef -80 PPM.
C451	5496219P257	Ceramic disc: 56 pf $\pm$ 5%, 500 VDCW, temp coef -80 PPM.
		- - - - - DIODES AND RECTIFIERS - - - - -
CR425	4038056P1	Germanium.

SYMBOL	G-E PART NO	DESCRIPTION
J425 thru J429	4033513P4	<p>----- JACKS AND RECEPTACLES -----</p> <p>Pin, contact: sim to Bead Chain L93-3.</p>
L425	19A121085G1	<p>----- INDUCTORS -----</p> <p>Coil Assembly. Includes tuning slug 19B200497P2.</p>
L426	19A121084G1	Coil Assembly. Includes tuning slug 19B200497P2.
L427	19A121083G1	Coil Assembly. Includes tuning slug 19B200497P2.
L428	19A121085G1	Coil Assembly. Includes tuning slug 19B200497P2.
Q425* and Q426*	19A115925P1	<p>----- TRANSISTORS -----</p> <p>Silicon, NPN.</p>
	19A115342P1	<p>Earlier than REV B:</p> <p>Silicon, NPN.</p>
R425	3R152P103K	<p>----- RESISTORS -----</p> <p>Composition: 10,000 ohms <math>\pm 10\%</math>, 1/4 w.</p>
R426	3R152P203J	Composition: 20,000 ohms $\pm 5\%$ , 1/4 w.
R427	3R152P103K	Composition: 10,000 ohms $\pm 10\%$ , 1/4 w.
R428	3R152P472K	Composition: 4700 ohms $\pm 10\%$ , 1/4 w.
R429 and R430	3R152P102K	Composition: 1000 ohms $\pm 10\%$ , 1/4 w.
R431	3R152P331K	Composition: 330 ohms $\pm 10\%$ , 1/4 w.
R432	3R152P203J	Composition: 20,000 ohms $\pm 5\%$ , 1/4 w.
R433 and R434	3R152P103K	Composition: 10,000 ohms $\pm 10\%$ , 1/4 w.
XY425 and XY426	5490277P1	<p>----- SOCKETS -----</p> <p>Transistor: 4-contact, low-loss mica-filled phenolic; sim to Elco 3303.</p>
Y425 and Y426	19B206221P1	<p>----- CRYSTALS -----</p> <p>NOTE: When reordering give GE Part Number and specify exact freq needed.</p> <p>Crystal Freq = (OF -10.7 MHz) <math>\div</math> 3.</p> <p>Quartz: freq range 39 to 62 MHz.</p>
		<p>MECHANICAL PARTS (See RC-1093)</p>
1	19A121088P1	Can. (Used with L425 and L428).
2	19B204601G1	Shield Assembly. (Used with C302, C303, C309 and C310).
3	19B204491P1	Cover. (Used with L308 thru L315).
4	4038844G1	Shield Assembly. (Used with L308 thru L318).
5	19B204442P2	Cover.
6	19B204612G1	Shield Assembly. (Used with L317 and L318).
7	19B204493G1	Shield Assembly.
8	4036555P1	Insulator, washer: nylon. (Used with Q312 and Q315).
9	19B204599G1	Shield Assembly. (Used with L308 thru L315).
10	19B204439P1	Cover.



## PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

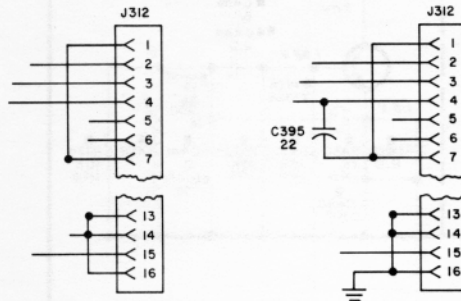
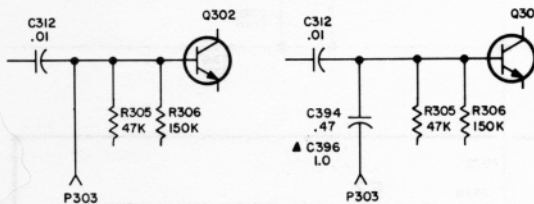
REV. A (19D402257-G1 only) - To match voice coil hi and ground of J312 to G-E Test Set 4EX3A10. Moved VOICE COIL HI from J312-7 to J312-15. Moved GND from J312-15 to J312-7.

REV. B (19D402257-G1 only) - To improve systems spurious. Added C394, C395, C396, ground lug under mounting screw of J312, and jumper between ground lug and J312-16.

### Elementary Diagram Changes

Was

Changed to



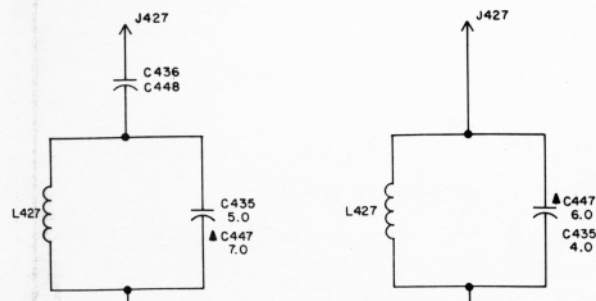
REV. C (19D402257-G1 only) - To improve audio response characteristics. Changed C368, C369, C375, R354 and R355. Deleted C373 from collector to base of Q311.

REV. A (4EG20A10-13 only) - To improve systems spurious. Deleted C436 and C448, and changed C435 and C447.

### Elementary Diagram Changes

Was

Changed to





REV. D (19D402257-G1 only) - To reduce squelch clipping at high signal levels. Added C397.

REV. E (19D402257-G1 only) - To prevent squelch changes with temperature and to reduce gain of RF Amplifier. Changed C306, C313, C357, C381, L303 and R360. Deleted R359.

REV. F (19D402257-G1 only) - To improve temperature stability. Changed C324 and C392.

REV. G (19D402257-G1 only) - To minimize the affects of line voltage transients on receiver operation. Added R378.

REV. B (4EG20A10-13) - To incorporate an improved transistor. Changed Q425 and Q426.

REV. C (4EG20A10-13) - To prevent free-running of oscillator without crystal. Changed C429, C433 & C438.

REV. H (19D402257-G1) - To improve 1st mixer stability. Changed C313.

REV. J (19D402257-G1) - To eliminate 450 kHz from the squelch circuit and lower maximum squelch operating level. Changed C366.

REV. K (19D402257-G1) - To provide improved bypass capacitors in low IF circuit. Changed C346, C349, C351 and C354.

REV. L (19D402257-G1) - To facilitate manufacturing and procurement of parts. Changed L308 - L318, R366 and R372.

REV. M (19D402257-G1) - To prevent squelch lock-up at high signal levels. Deleted C397. Changed CR308.

REV. N (19D402257-G1) - To improve discriminator idling and tuning. Added R379.

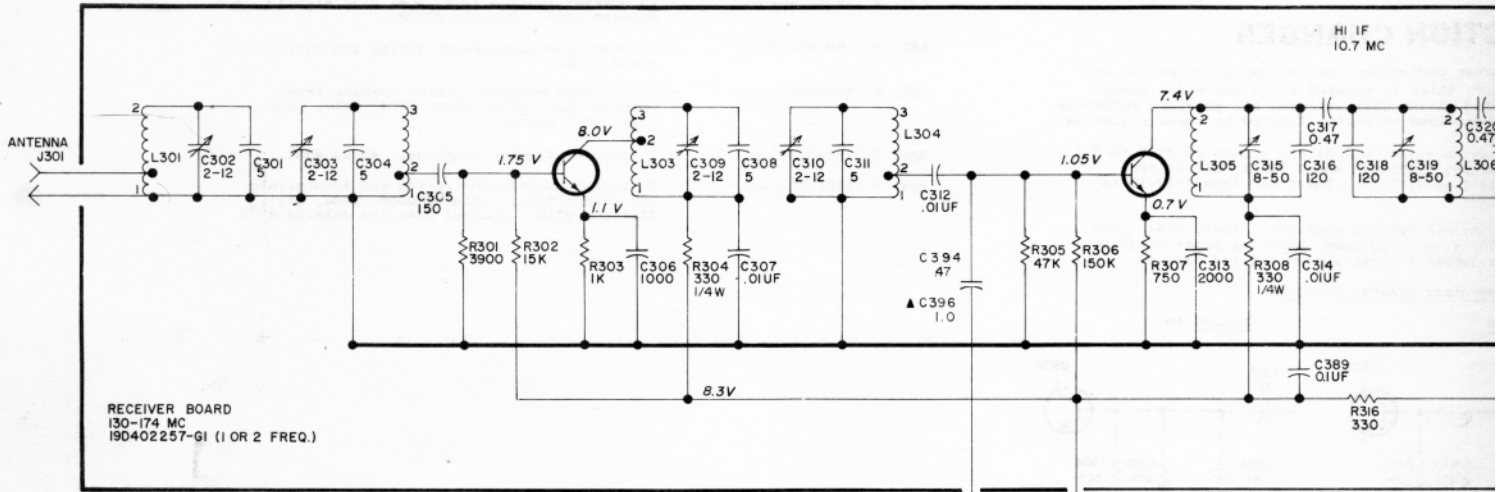
REV. P (19D402257-G1) - To increase maximum squelch opening level. Changed C328, C330, C332, C334, C336, C338, C340, Q310 and Q313.

REV. R (19D402257-G1) - To improve squelch clipping. Added R381.

REV. S (19D402257-G1) - To improve squelch operation and incorporate new transistors. Changed Q305, Q306, Q311, Q314 and Q316. Changed R344 and deleted R381.

RF AMP  
Q301

1ST MIXER  
Q302



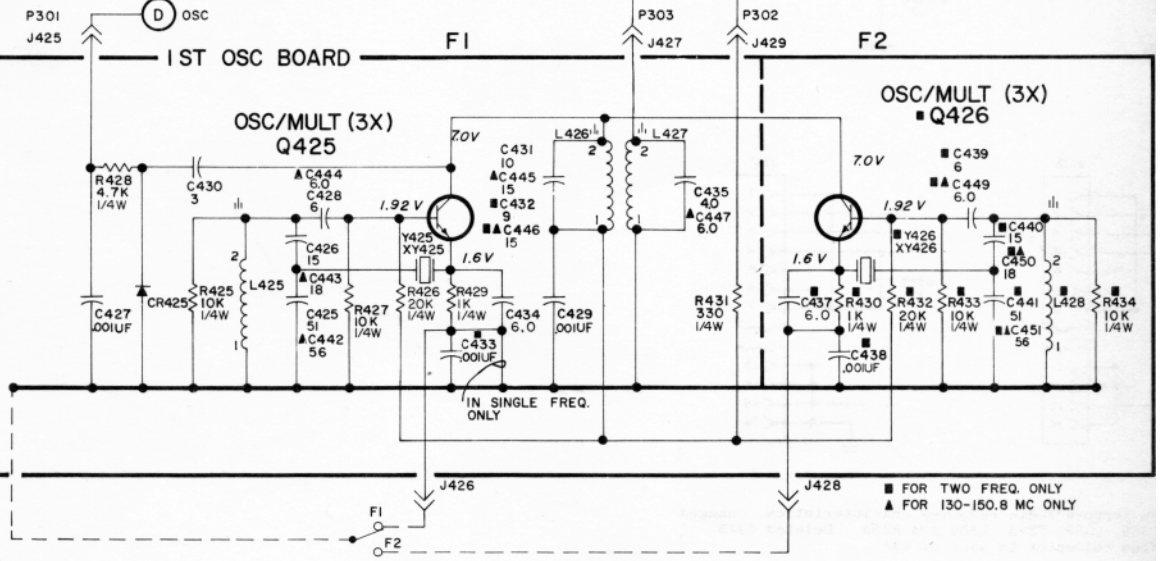
OSCILLATOR BOARD

130-150.8 MC  
4EG20A10 (1 FREQ.)  
4EG20A11 (2 FREQ.)

150.8-174 MC  
4EG20A12 (1 FREQ.)  
4EG20A13 (2 FREQ.)

OSC/MULT (3X)  
Q425

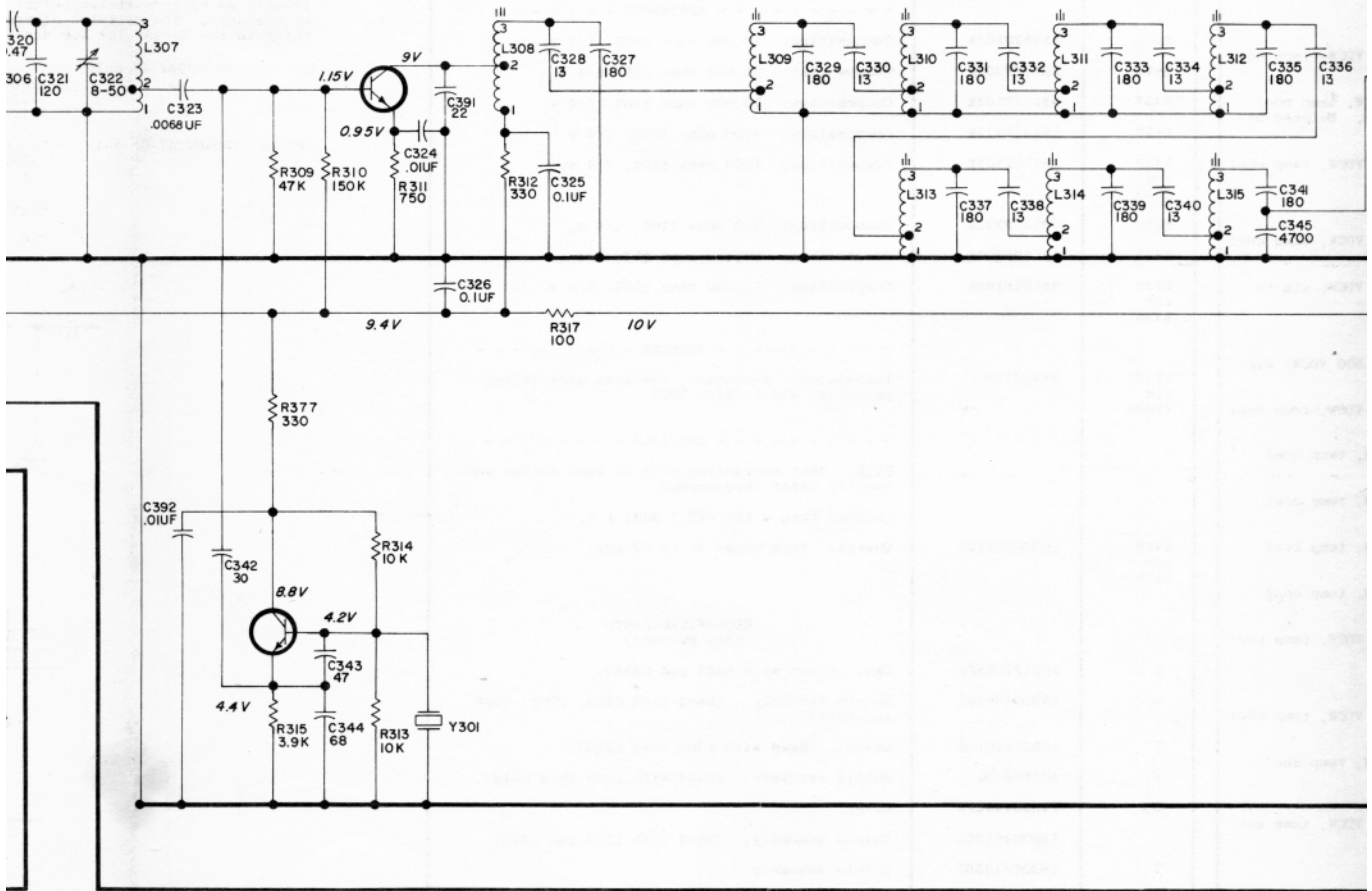
OSC/MULT (3X)  
Q426



(DF-1082)

2ND MIXER  
Q304

LO IF  
455 KC



2ND OSCILLATOR  
Q303

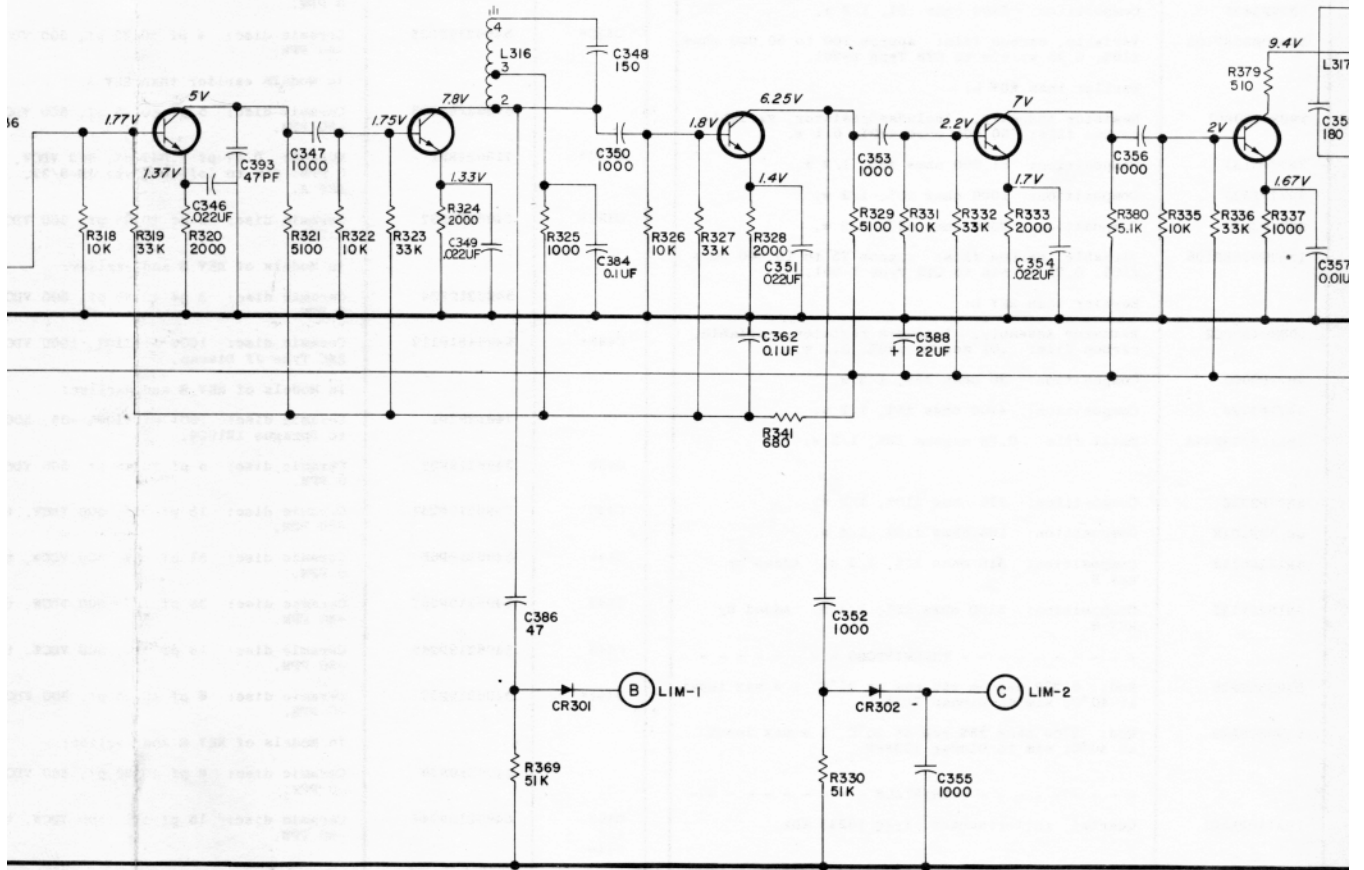
1ST LOW IF  
Q305

2ND LOW IF  
Q306

1ST LIMITER  
Q307

2ND LIMITER  
Q308

3RD LIMITER  
Q309



VOLTAGE READINGS

READINGS ARE TYPICAL VOLT-  
AGES MADE WITH A 20,000 OHM-  
PER-VOLT-METER MEASURED TO  
J312-1 (GND).  
US- UNSQUELCHED  
S- CRITICAL SQUELCH

SEE APPLICABLE PRODUCTION CHANGE  
SHEETS IN INSTRUCTION BOOK SECTION  
DEALING WITH THIS UNIT, FOR DES-  
CRPTION OF CHANGES UNDER EACH  
REVISION LETTER

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
PL 19D4022 57G1	S
4 EG 20A10	C
4 EG 20A11	C
4 EG 20A12	C
4 EG 20A13	C

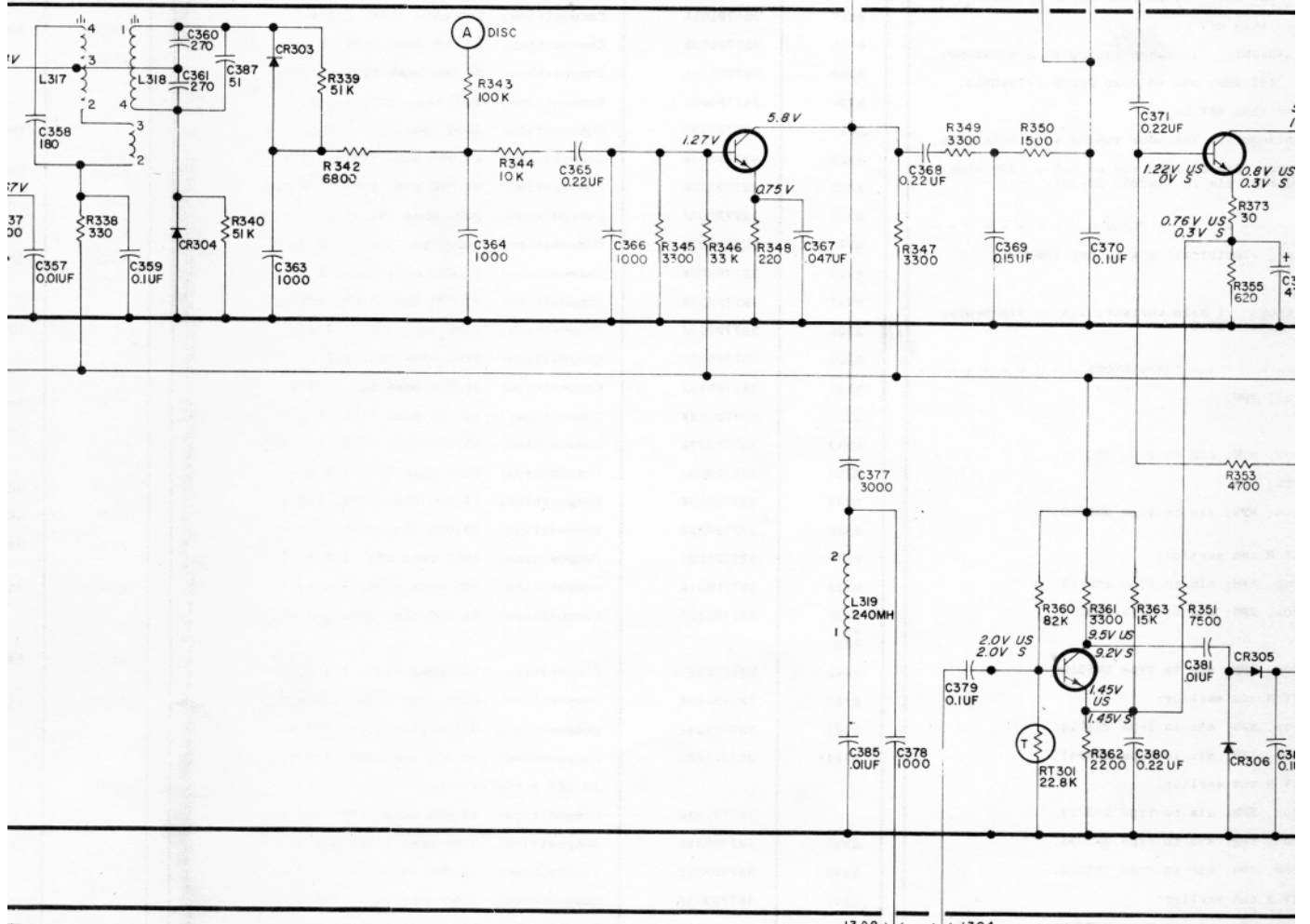


TER

DISC

### AUDIO & NOISE AMPLIFIER Q310

AUDIO



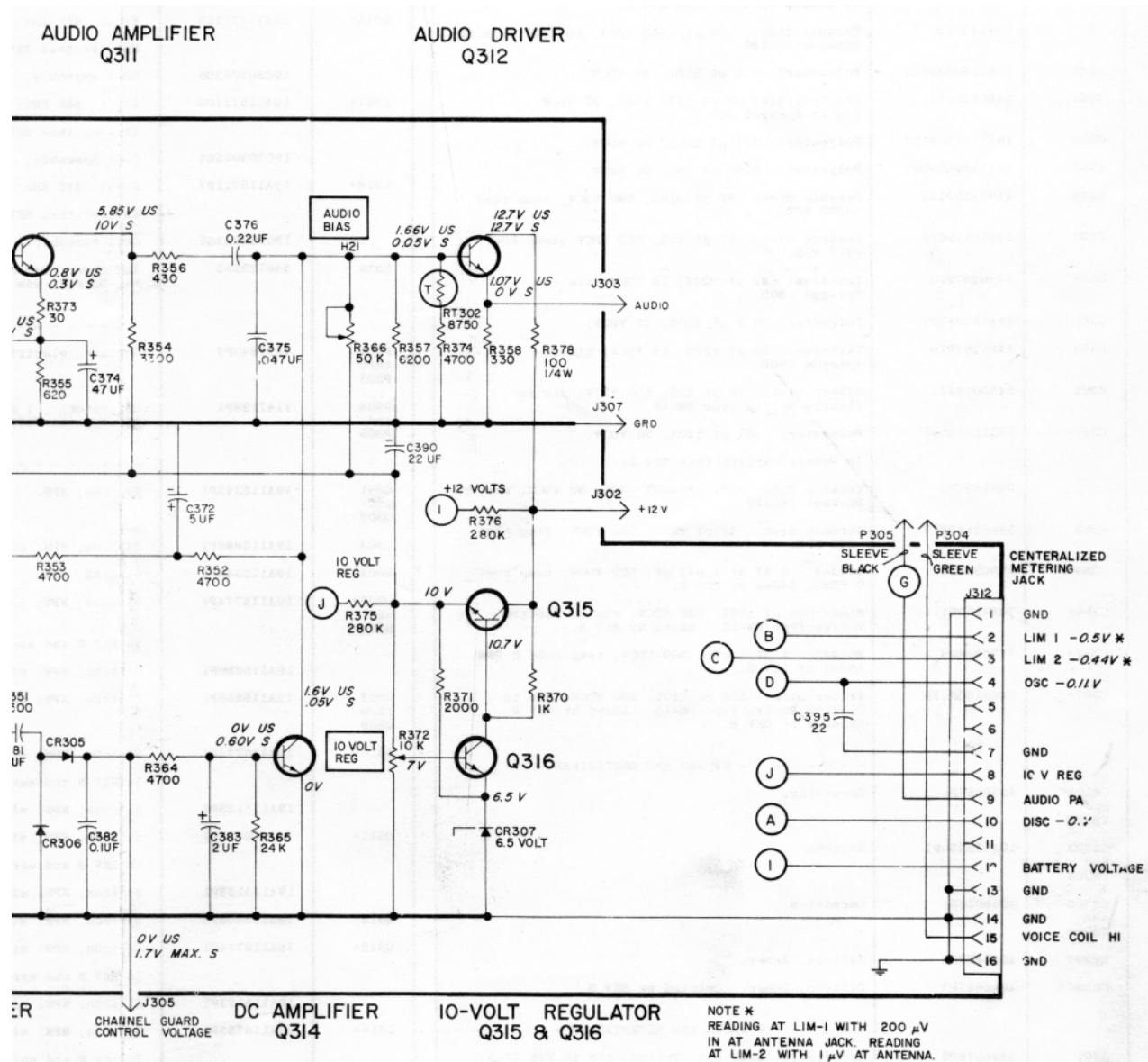
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

### NOISE AMPLIFIER Q313

SQUELCH CONTROL

CC



**SERVICE SHEET**

132—174 MHz RECEIVER  
 MODELS 4ER44A10-13  
 RECEIVER BOARD 19D402257-G1  
 OSCILLATOR BOARD 4EG20A10-13

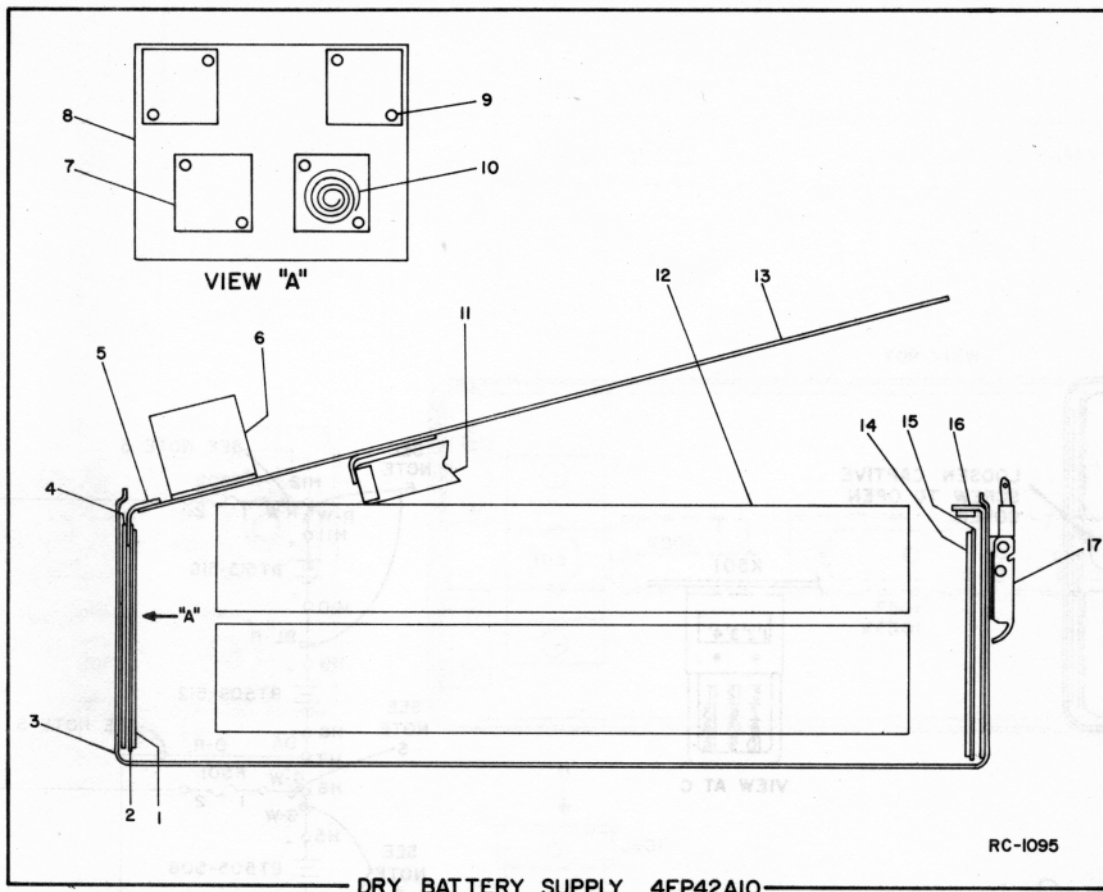
**PARTS LIST**

LBI-3490C

DRY BATTERY POWER SUPPLY  
MODEL 4EP42A10  
(19C303563G1)

SYMBOL	GE PART NO.	DESCRIPTION
----- BATTERIES -----		
BT501 thru BT516	19B209193P1	Dry alkaline: 1.5 v, "D" size cell.
----- DIODES AND RECTIFIERS -----		
CR501	5495920P1	Germanium; sim to Type 1N91.
CR502*	4037822P1	Silicon. Added by REV B.
----- FUSES -----		
F501 and F502	1R16P4	Quick blowing, cartridge: 1.5 amps at 250 v; sim to Littelfuse 31201.5 or Bussmann AGC-1-1/2.
----- JACKS AND RECEPTACLES -----		
J501	19A121226P1	Connector: 8 terminals, phenolic; sim to HB Jones 261-32-02-000.
----- RELAYS -----		
K501*	19C307010P5	Relay: Armature, 12 VDC nominal, 130 ohms, 10% coil res, 4 form C contacts; sim to Allied Control T154-X413.  In Models earlier than REV A:
	19C300957P2	Miniature, plug-in: 12 VDC, 185 ohms $\pm 10\%$ , 4 form C contacts; sim to Allied Control T154-X-316.
----- SOCKETS -----		
XF501 and XF502	7141008P1	Holder, fuse: molded plastic base, 5 amps at 125 v, with clip; sim to Littelfuse E-357001.
XK501	5491595P5	Relay: 16 contacts, nylon, ground spring; sim to Allied Control 30054-2.
MECHANICAL PARTS (SEE RC-1095)		
1	19B204715G1	Board Assembly: (Includes items 7, 8, 9 and 10).
2	19A121632P2	Insulator.
3	19B204716G1	Can Assembly.
4	19A121582G1	Support Assembly.
5	19A121633P1	Hinge.
6	19A121181G1	Support Assembly. (Used with J501).
7	19A121407P1	Contact. (Part of Board Assembly, 19B204715G1).
8	19B204714P1	Board. (Part of Board Assembly, 19B204715G1).
9	N330P904F22	Eyelet. (Part of Board Assembly, 19B204715G1).
10	19A121408P1	Spring, conical. (Part of Board Assembly, 19B204715G1).
11	5491595P9	Spring; retainer: wire; sim to Allied Control 30040-2. (Used with K501).
12	19B216752G1	Tube. (Used with BT501 thru BT516).
13	19B204711G1	Cover Assembly.
14	19C303647P1	Board, printed.
15	19A121632P1	Insulator.
16	19A121583G1	Support Assembly.
17	4029994P2	Catch, pull-down: chrome plated steel; sim to Nielsen SC-B-83314.

\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



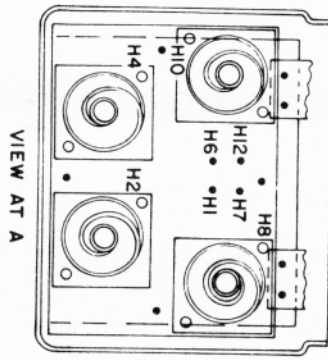
### PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

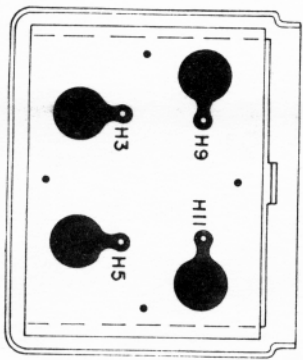
REV. A - To extend life of dry battery. Changed K501.

REV. B - To provide relay arc suppression. Added CR502.

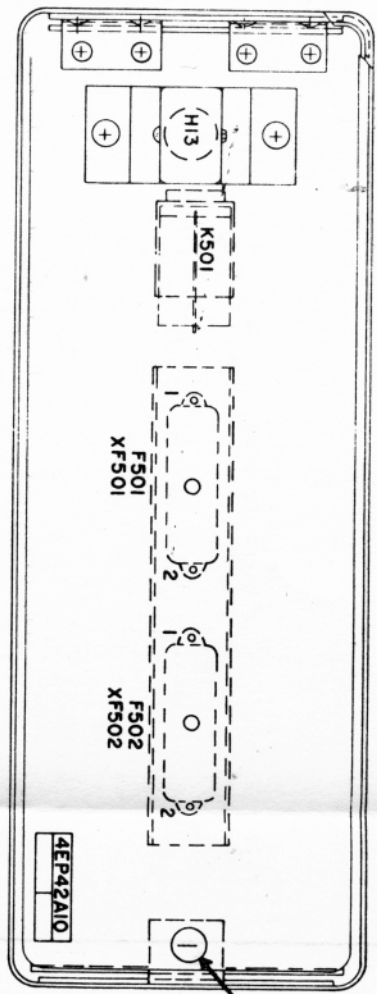




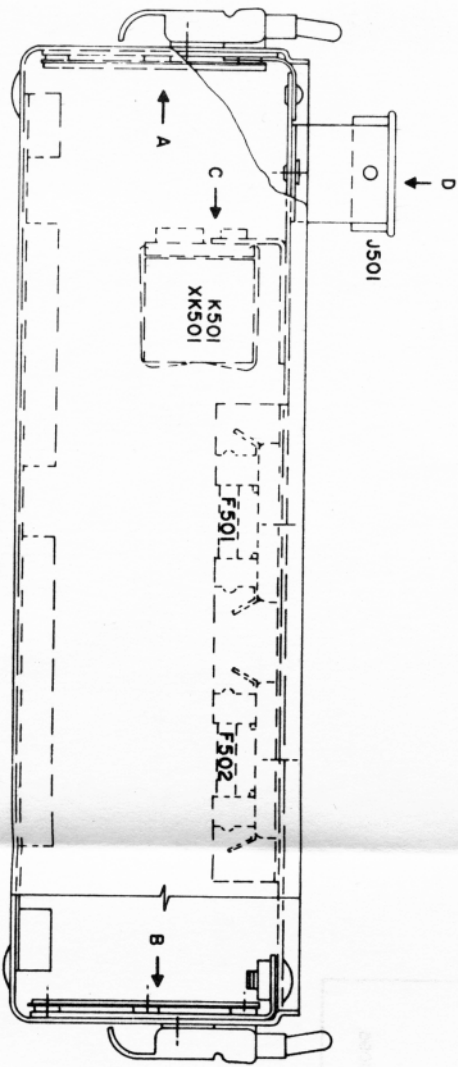
VIEW AT A



VIEW AT B

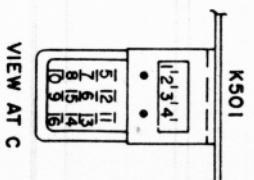


TOP VIEW



SIDE VIEW

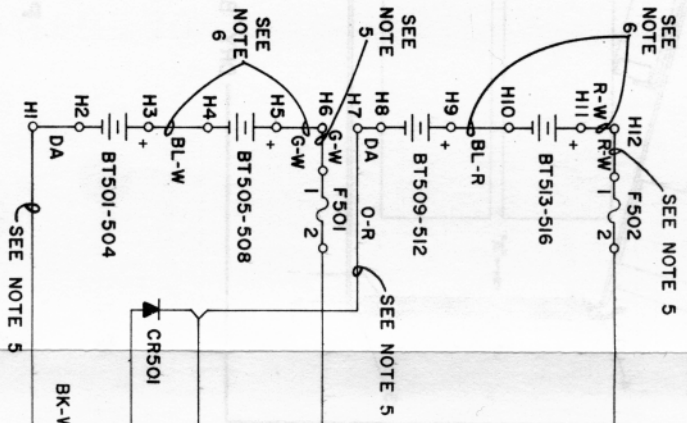
(19C303698, Rev. 0)



VIEW AT C

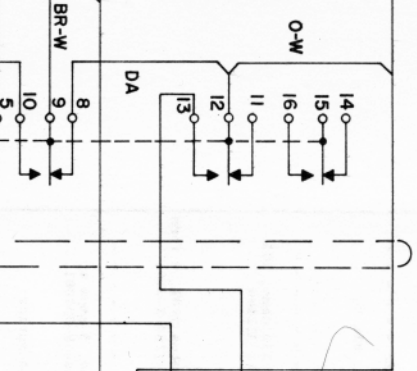


VIEW AT D



- NOTES:
1. ALL WIRES #20 UNLESS OTHERWISE SPECIFIED.
  2. SLEEVE ALL CONNECTIONS ON J501 EXCEPT PINS 1, 7, & 8 AND ALL CONNECTIONS ON K501 EXCEPT PINS 4, 6, & 8.
  3. WIRES BEHIND BOTH BOARDS MUST NOT CROSS.
  4. SLEEVE CR501.

5. SLEEVE THESE 4 LEADS TOGETHER WITH 7150727P118 1.25 ±.12 LG.
6. SLEEVE EACH PAIR OF 2 LEADS WITH 7162411P16 10.00 ±.50 LG.



OUTPUT JACK

J501

- 1 DA + 24V XMTR
- 2 R-W + 24V XMTR PA
- 3 BK-W GND
- 4 BL-W + 12V/24V KEYED
- 5 O-W + 12V/24V BTRY
- 6 BR-W + 12V BTRY
- 7 DA
- 8 DA

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT. FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO  
 MODEL NO 4EP42A10  
 REV LETTER B

**PARTS LIST**

LBI-4065A

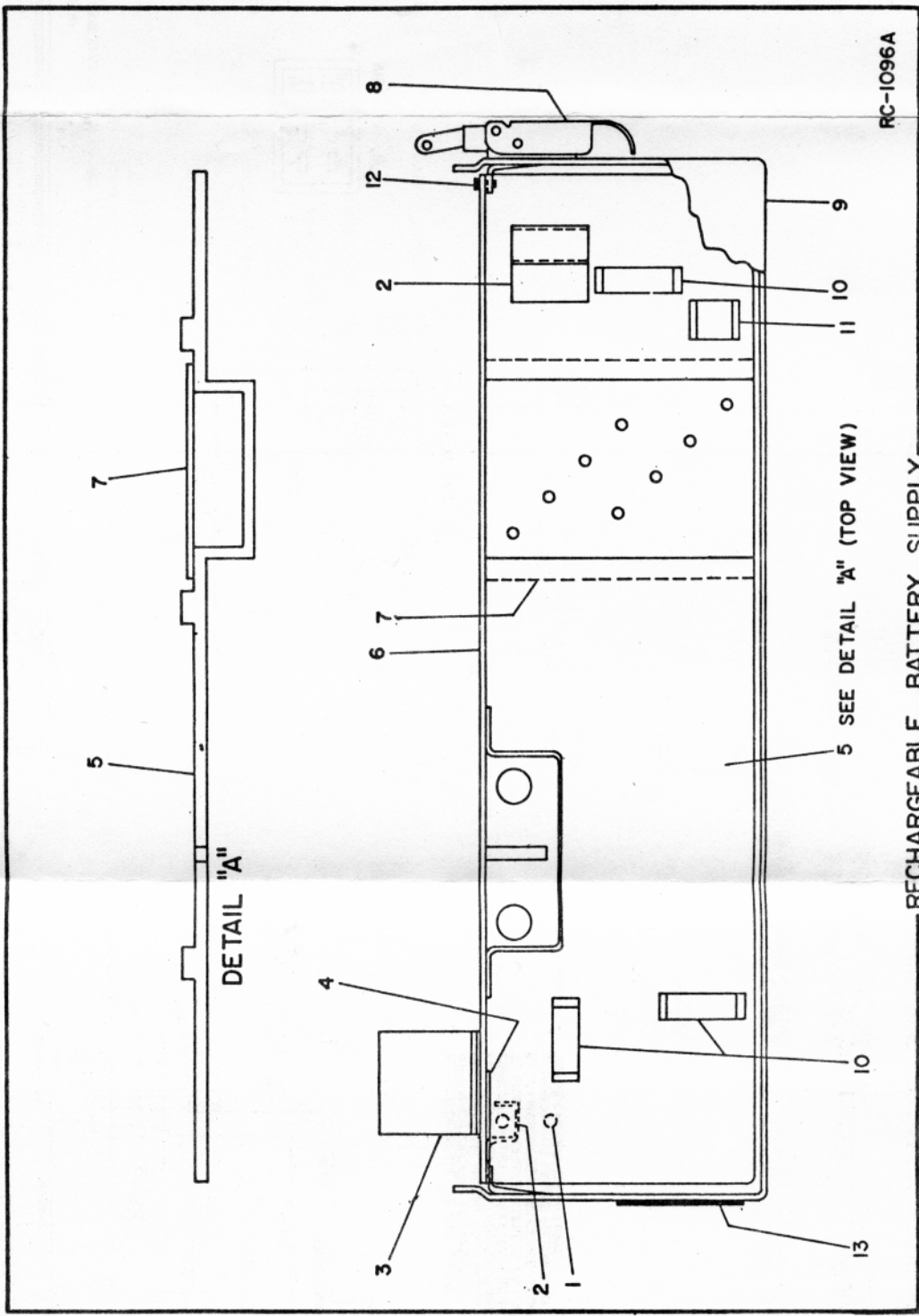
RECHARGEABLE BATTERY POWER SUPPLY  
MODEL 4EP65A10  
(19D402278G7)

SYMBOL	GE PART NO.	DESCRIPTION
		----- BATTERIES -----
BT501	19B209138P3	Storage, nickel-cadmium: 12.5 v (nominal).
		----- CAPACITORS -----
C501 and C502	7489483P17	Electrolytic tubular: 50 $\mu$ f +75%-10%, 25 VDCW; sim to Sprague 30D.
C503 thru C506	19A115680P6	Electrolytic: 50 $\mu$ f +150%-10%, 25 VDCW; sim to Mallory Type TT.
		----- DIODES AND RECTIFIERS -----
CR501 thru CR506	19A115845P1	Silicon.
CR11	19A115845P1	Silicon.
CR12 and CR13	19A115823P1	Silicon.
		----- INDICATING DEVICES -----
DS501	19C307037P6	Lamp, incandescent: sim to GE 1819.
		----- JACKS AND RECEPTACLES -----
J501	19A121226P1	Connector: 8 terminals, phenolic; sim to HB Jones 261-32-02-000.
J502	19A121209G1	Connector Assembly.
J503	4034405P6	Connector, polarized: 5 pins; sim to Cannon XLR-5-32.
		----- INDUCTORS -----
L501	7143944P2	Choke, RF: 120 $\mu$ h $\pm$ 10%, .064 ohm max DC res.
L502 and L503	19B209166P1	Choke: 1 mh ind $\pm$ 10% at 1000 Hz, 0.5 ohm max DC res, 50 VDC operating.
		----- PLUGS -----
P501	19B209137P2	Terminal set, quick disconnect: 2 tabs; sim to Thomas and Betts 121504. (Part of BT501).
		----- TRANSISTORS -----
Q501 and Q502	19A115293P1	Germanium, PNP.
		----- RESISTORS -----
R501	5493035P1	Wirewound: 5 ohms $\pm$ 5%, 5 w; sim to Tru-Ohm X-60.
R503 and R504	7147161P5	Composition: 2.7 ohms $\pm$ 10%, 1/2 w.
		----- TRANSFORMERS -----
T501	19B204478G1	Transformer Assembly.
		----- TERMINAL BOARDS -----
TB1	7487424P5	Phenolic: 3 terminals.
TB2	7487424P6	Phenolic: 3 terminals.
TB3	7487424P2	Phenolic: 1 terminal.
TB4 and TB5	7487424P16	Phenolic: 2 terminals.
TB6	7487424P5	Phenolic: 3 terminals.
TB7	7487424P6	Phenolic: 3 terminals.

\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

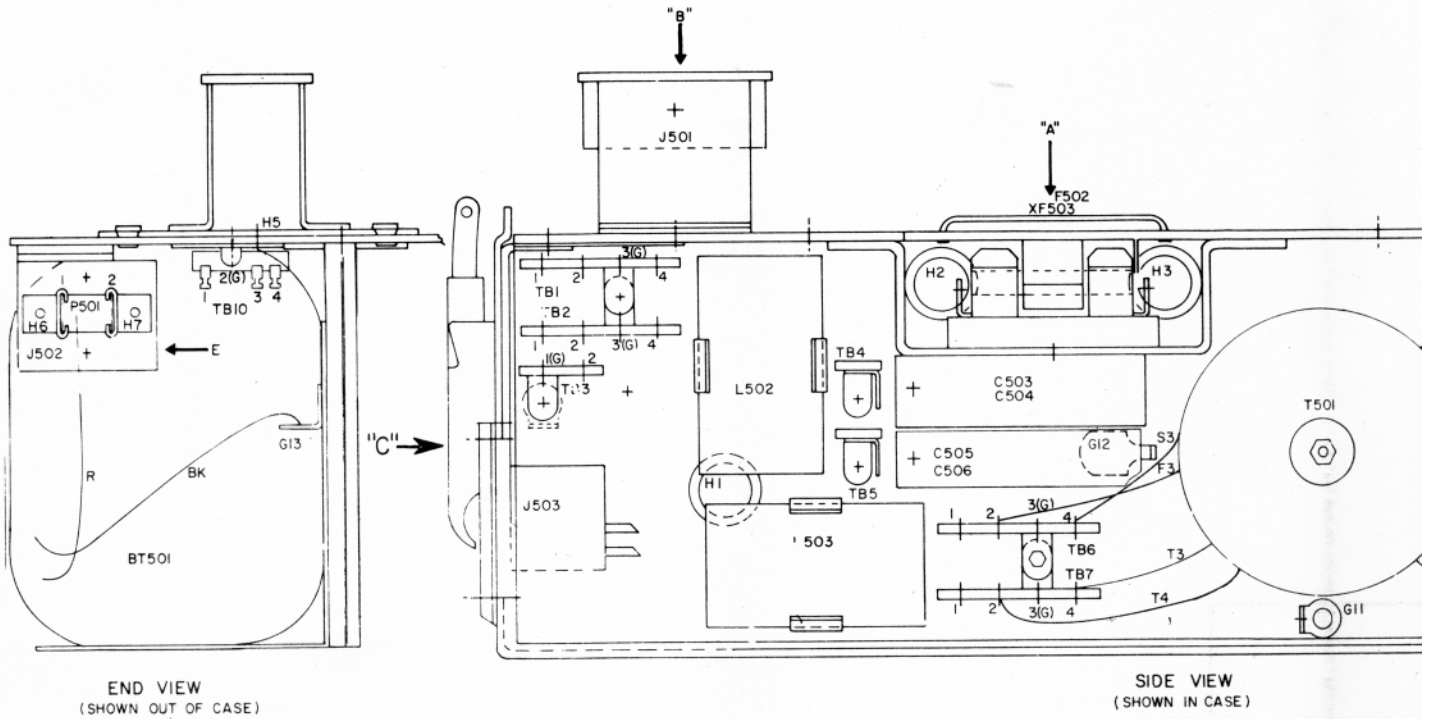
SYMBOL	GE PART NO.	DESCRIPTION
TB8	7775500P7	Phenolic: 3 terminals.
TB9	7775500P4	Phenolic: 2 terminals.
TB10	7487424P5	Phenolic: 3 terminals.
----- CABLES -----		
WS02	19A121227P2	Cable: approx 8.75 inches long.
----- SOCKETS -----		
XDS501	4032220P1	Lamp: miniature bayonet base, 6" leads; sim to Drake N517.
XF503		FUSEHOLDER ASSEMBLY 19B204644G1
----- FUSES -----		
F502	19A115327P2	Cartridge: 5 amps at 125 v; sim to Littelfuse 362005.
	19A121326P1	Fuseholder.
DC TRICKLE CHARGE CABLE 19B204993G2		
----- MISCELLANEOUS -----		
	19A115513P1	Plug: 12-volt cigarette lighter adaptor.
	4034405P5	Connector, polarized: 5 contacts; sim to Cannon XLR-5-11C.
	7160478P1	Cable: 2 conductors, No. 20 wire; sim to Birnbach 789.
MECHANICAL PARTS (SEE RC-1096)		
1	7140624P5	Spacer: (Used with J502).
2	4038930P1	Clip: (Used with RD501 and RD502).
3	19A121181G1	Support Assembly: (Used with J501).
4	19A121175P5	Insulator: (Located by TB1).
5	19D402274P1	Casting.
6	19A121166G1	Plate Assembly.
7	19A121162P1	Plate: (Used with Q501 and Q502).
8	4029994P2	Catch, pull-down: chrome plated steel; sim to Nielsen SC-B-33314.
9	19C303444G3	Can Assembly.
10	7118719P4	Clip, mounting: sim to Prestole E-50005-038. (Used with L501 thru L503).
11	4032248P1	Clip: sim to Augat Bros 6185-1A. (Used with XDS501).
12	19B201074P204	Tap screw: No. 4-40 x 1/4.
13	NP257964	Nameplate. (USE EXTERNAL CHARGER).





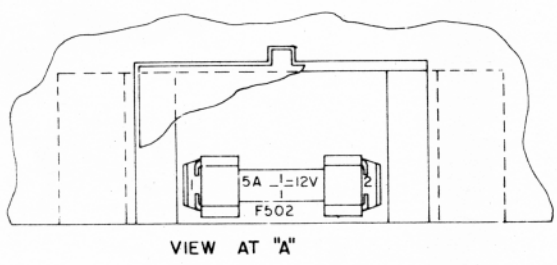
RC-1096A

RECHARGEABLE BATTERY SUPPLY

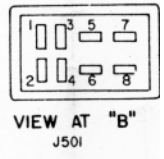
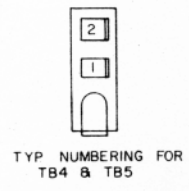


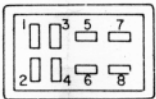
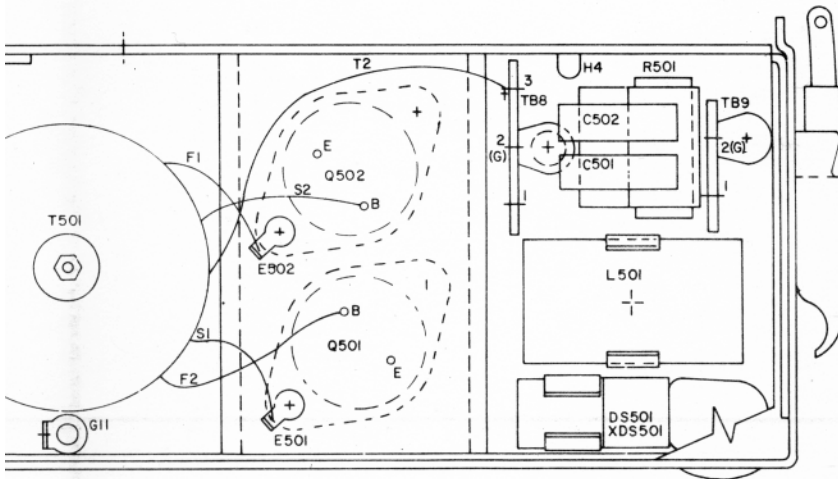
END VIEW  
(SHOWN OUT OF CASE)

SIDE VIEW  
(SHOWN IN CASE)

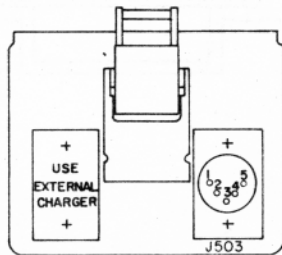


VIEW AT "A"

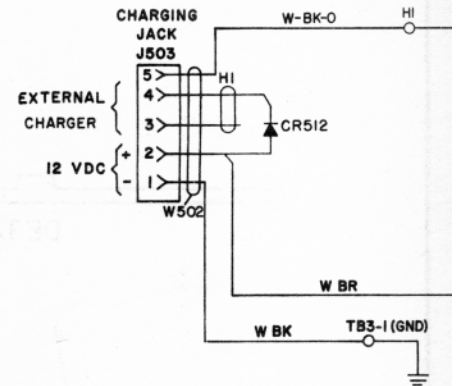
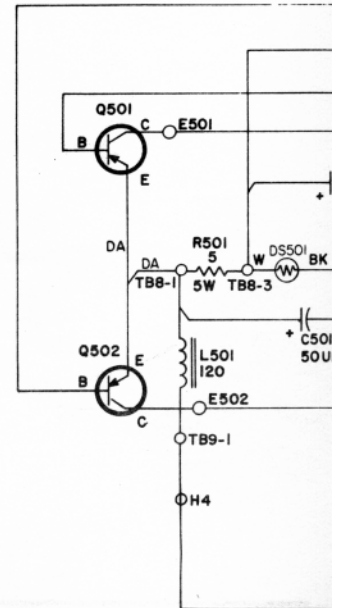




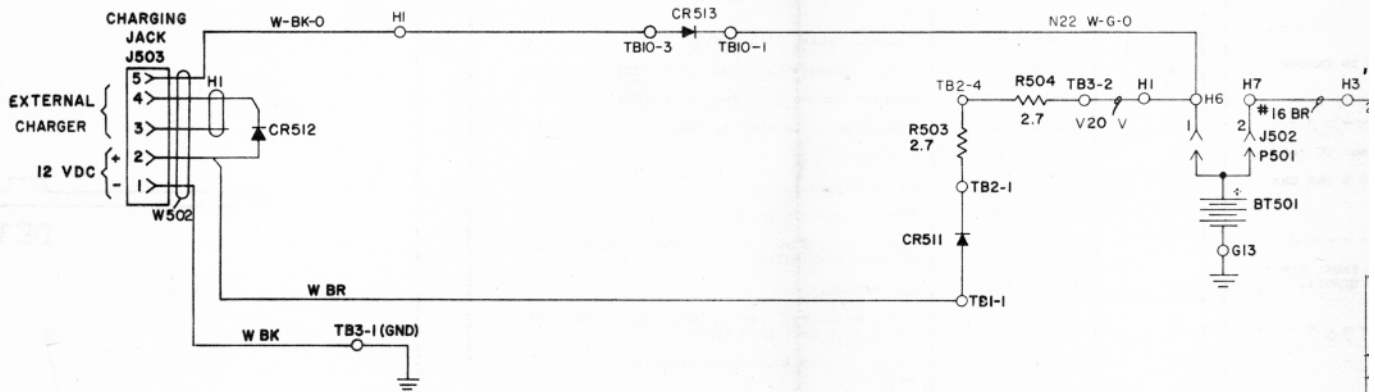
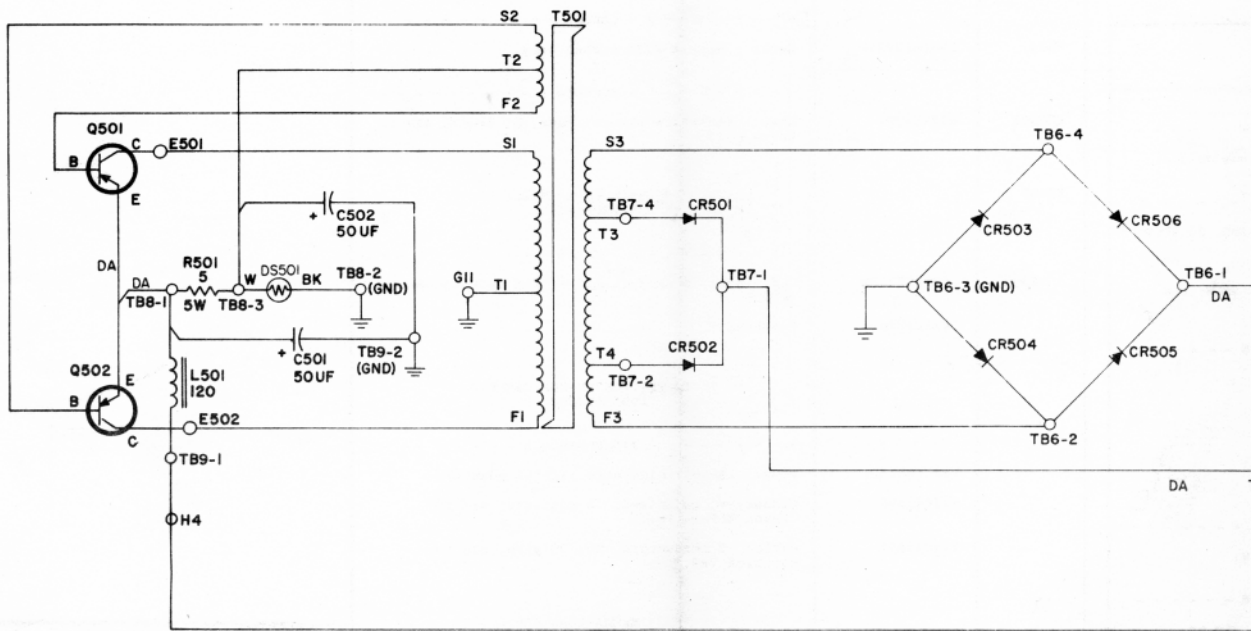
VIEW AT "B"  
J501



VIEW AT "C"



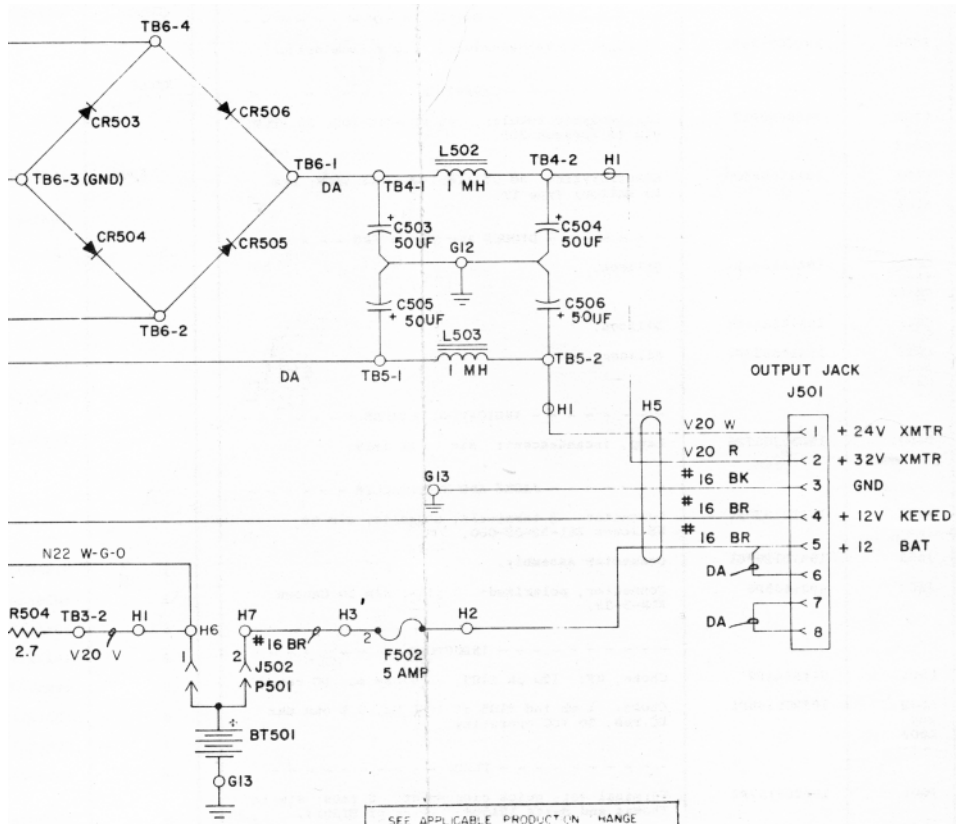
ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICO FARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.



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IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.





SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
4EP65A10	

3)

## SERVICE SHEET

RECHARGEABLE POWER SUPPLY  
MODEL 4EP65A10

RC-1891C)

**PARTS LIST**

LBI-3634D  
 12 VOLT POWER SUPPLY  
 MODEL 4EP47A10  
 REV D

SYMBOL	GE PART NO.	DESCRIPTION
A501		COMPONENT BOARD ASSEMBLY 19B205013G1
		----- DIODES AND RECTIFIERS -----
CR1 thru CR6	4037822P1	Silicon.
		----- CAPACITORS -----
C501	7489483P17	Electrolytic: 50 $\mu$ f +75% -10%, 25 VDCW; sim to Sprague Type 30D.
C502	7489483P7	Electrolytic: 10 $\mu$ f +75% -10%, 25 VDCW; sim to Sprague Type 30D.
C503	5491189P7	Polyester: 0.15 $\mu$ f $\pm$ 20%, 50 VDCW.
C504	7489483P17	Electrolytic: 50 $\mu$ f +75% -10%, 25 VDCW; sim to Sprague Type 30D.
C505*	19A115680P6	Electrolytic: 50 $\mu$ f +150% -10%, 50 VDCW; sim to Mallory Type TT. In REV C and earlier:
	19B209283P1	Electrolytic: 50 $\mu$ f +75% -10%, 65 VDCW.
C506*	19A115680P6	Electrolytic: 50 $\mu$ f +150% -10%, 50 VDCW; sim to Mallory Type TT. In REC C and earlier:
	7489483P25	Electrolytic: 50 $\mu$ f +75% -10%, 50 VDCW; sim to Sprague Type 30D.
C507*	19A115680P6	Electrolytic: 50 $\mu$ f +150% -10%, 50 VDCW; sim to Mallory Type TT. In REV C and earlier:
	5496267P20	Tantalum: 47 $\mu$ f $\pm$ 20%, 35 VDCW; sim to Sprague Type 150D.
C508*	19A115680P6	Electrolytic: 50 $\mu$ f +150% -10%, 50 VDCW; sim to Mallory Type TT. In REV C and earlier:
	19B209283P1	Electrolytic: 50 $\mu$ f +75% -10%, 65 VDCW.
C509 and C510	7489483P17	Electrolytic: 50 $\mu$ f +75% -10%, 25 VDCW; sim to Sprague Type 30D.
C511	7489483P27	Electrolytic: 10 $\mu$ f +75% -10%, 150 VDCW; sim to Sprague Type 30D.
C512	7489162P39	Silver mica: 330 pf $\pm$ 5%, 500 VDCW; sim to Electro Motive Type DM-15.
C513* and C514*	7774750P15	Ceramic disc: 0.02 $\mu$ f +100% -0%, 500 VDCW. Added by REV C.
		----- DIODES AND RECTIFIERS -----
CR501*	4036887P12	Silicon, Zener. Earlier than REV A:
	5496365P3	Silicon, Zener.
CR502 and CR503	5494922P6	Silicon; sim to Type 1N462.
CR504 thru CR511	4037822P1	Silicon.
CR18*	4037822P1	Silicon. Added by REV B.
		----- INDICATING DEVICES -----
DS501	19C307037P6	Lamp, incandescent: 28 v; sim to GE 5128.

\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
		----- FUSES -----
F501 thru F503	1R16P2	Cartridge, quick blowing: 3/4 amp at 250 v; sim to Littelfuse 312.750 or Bussmann AGC-3/4.
		----- JACKS AND RECEPTACLES -----
J501	19A121226P1	Connector, phen: 8 female contacts rated at 10 amps at 730 VRMS; sim to HB Jones 261-32-08-000 (modified).
J502	4034405P4	Connector: 3 male pins rated at 15 amps at 133 VRMS; sim to Cannon XLR-3-32.
		----- RELAYS -----
K501	19B209240P2	Armature, open: 12 VDC nominal, 2 w max opera- ting, 100 ohms $\pm 10\%$ coil res, 1 form C contact rated at 15 amps at 115 VAC; sim to Magnecraft W88-150.
K502	19C300957P2	Armature: 12 VDC nominal, 1.5 w max operating, 185 ohms $\pm 10\%$ coil res, 4 form C contacts; sim to Allied Control T154X-316.
K503	19B209249P1	Armature, open: 1 amp nominal, 1.1 w max opera- ting, 0.5 ohm $\pm 20\%$ coil res, 1 form C contact rated at 1 amp at 28 VDC or 115 VAC; sim to RBM X9559KT.
		----- INDUCTORS -----
L501	7143944P2	Choke, RF: 120 $\mu$ h $\pm 10\%$ , .064 ohm DC res max.
L503 and L504	19B209166P1	Reactor: 0.9 mh min, 0.5 ohm DC res max, 50 v peak, 50 VDC operating.
		----- TRANSISTORS -----
Q501 thru Q503	5490810P1	Germanium, PNP.
		----- RESISTORS -----
R501	3R78P202K	Composition: 2000 ohms $\pm 10\%$ , 1 w.
R502	5493035P6	Wirewound: 3 ohms $\pm 5\%$ , 5 w; sim to Hamilton Hall Type HR.
R503	3R77P202J	Composition: 2000 ohms $\pm 5\%$ , 1/2 w.
R504	19B209244P1	Variable, wirewound: 1000 ohms $\pm 20\%$ , 2 w; sim to CTS BL37463.
R506	5493035P15	Wirewound: 130 ohms $\pm 5\%$ , 10 w; sim to Hamilton Hall Type HR.
R507	3R78P102K	Composition: 1000 ohms $\pm 10\%$ , 1 w.
R508	3R78P100K	Composition: 10 ohms $\pm 10\%$ , 1 w.
R511	3R77P103K	Composition: 10,000 ohms $\pm 10\%$ , 1/2 w.
R516* and R517*	3R77P150K	Composition: 15 ohms $\pm 10\%$ , 1/2 w. Added by REV C.
		----- SWITCHES -----
S501	19B209261P1	Slide: 3 PDT, 3 amps at 125 VAC or 1 amp at 125 VDC; sim to Continental Wirt SW-369.
		----- TRANSFORMERS -----
T501	19B205009G1	Transformer.
		----- TERMINAL BOARDS -----
TB1	7775500P1	Phen: 2 terminals.
TB2	7775500P7	Phen: 3 terminals.
TB3 and TB4	7775500P1	Phen: 2 terminals.
TB5	7775500P2	Phen: 3 terminals.
TB6	7117710P2	Phen: 2 terminals; sim to Cinch 1781.
TB7	7487424P1	Miniature, phen: 1 terminal.
TB8 and TB9	7487424P7	Miniature, phen: 4 terminals.
TB10	7775500P10	Phen: 4 terminals.

SYMBOL	GE PART NO.	DESCRIPTION
TB11	7487424P1	Miniature, phen: 1 terminal.
TB12	7775500P3	Phen: 4 terminals.
TB13	7775500P9	Phen: 5 terminals.
TB18*	7487424P7	Miniature, phen: 4 terminals. Added by REV C.
		----- SOCKETS -----
XDS501	4032220P1	Lampholder, miniature: sim to Drake N517.
XF501	19A121163G3	Fuseholder: sim to Bushman Mfg Co 5678-14.
XF502	19A115164P2	Fuseholder, phen: 30 amps max; sim to Littelfuse 350284.
XK502	5491595P5	Relay: 16 contacts; sim to Allied Control 30054-2.
		----- POWER CABLE -----
	19C303640G3	12-Volt DC ± Ground
		MECHANICAL PARTS (SEE RC-1234)
1	19A121823G1	Support.
2	19A121830P1	Plate. (Used with S501).
3	7142162P100	Spacer: approx 13/16 inch long. (Used with S501).
4	7118719P4	Clip: sim to Prestole E-50005-038. (Used with L501, 503, 504).
5	4038930P1	Clip. (Used with R502, 506).
6	19B205010P1	Cover.
7	19A121181G1	Support. (Used with J501).
8	4035656P14	Standoff: approx 5/16 inch long. (Used with A501).
9	19A121822P1	Cover. (Used with Q501, 502).
10	4034214P1	Mica washer: for 7/32 inch screw. (Used with Q501-503).
11	N405P9C13	Split washer: for 3/8 inch screw. (Used with Q501-503).
12	4032596P1	Nut: 10-32. (Used with Q501-503).
13	4036835P1	Terminal: sim to Shakeproof 2118-10-01-2520N. (Used with Q501-503).
14	4034225P1	Flat washer: approx 1/2 inch dia. (Used with Q501-503).
15	19A121168P1	Washer. (Used with T501).
16	19A115316P1	Cup washer: sim to Zierick 220. (Used with T501).
17	7147194P11	Bushing. (Used with Q501-503).
18	4031291P1	Insulator. (Used with Q501-503).
19	7142162P99	Spacer.
20	19D402428P1	Casting.
21	19A121825P1	Support.
22	19B205007G1	Plate.
23	7140578P2	Speed nut: sim to Tinnerman C1691-017-67.
24	19A121821P1	Support. (Used with Q503).
25	19B205011G1	Support.
26	4029994P13	Pull-down catch: sim to Nielsen Hardware SC-B-83314-2.



PRODUCTION CHANGES

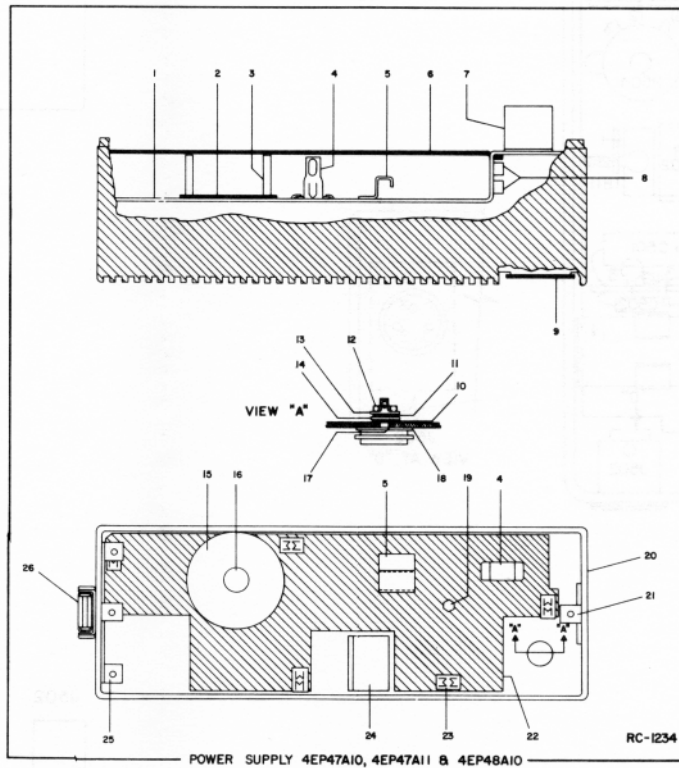
Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

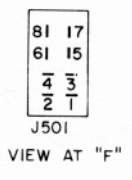
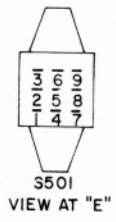
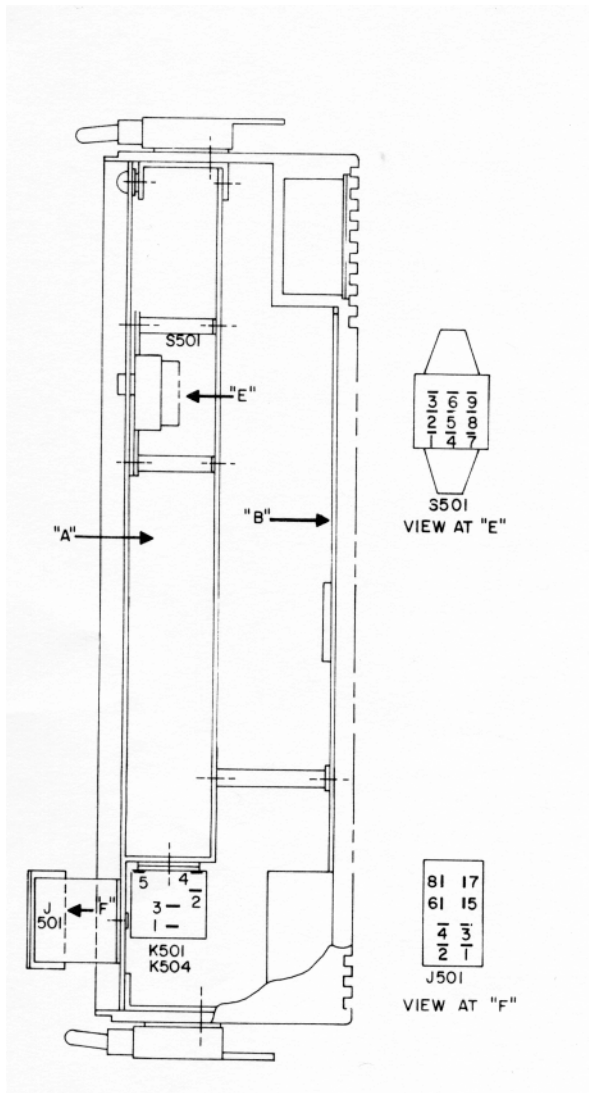
REV. A - To incorporate a more readily available component. Changed CR501.

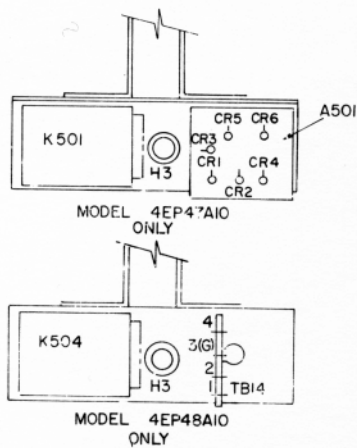
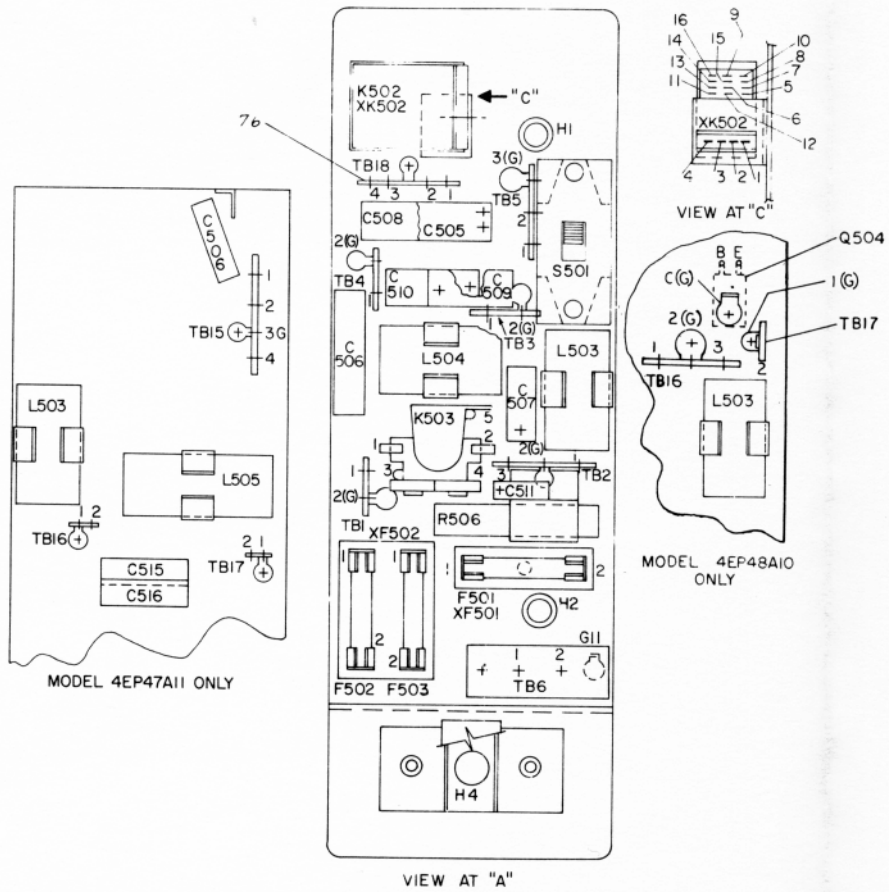
REV. B - To provide relay arc suppression. Added CR518.

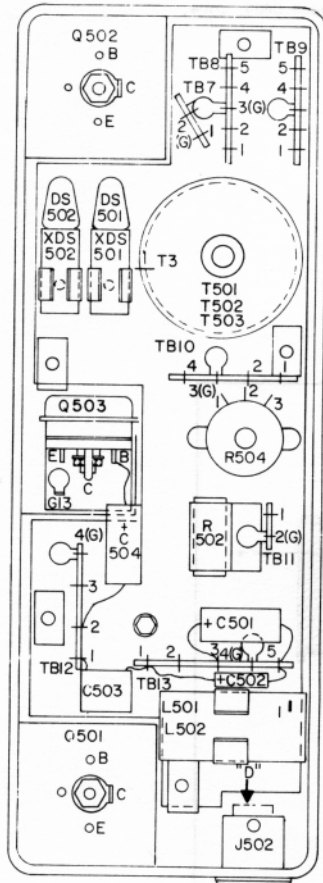
REV. C - To provide arc suppression for K502 contacts. Added C513, C514, R516, R517, and TB18.

REV. D - To improve filtering at low temperatures. Changed C505, C506, C507, and C508.

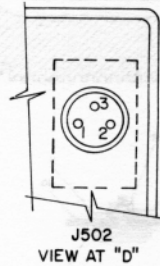
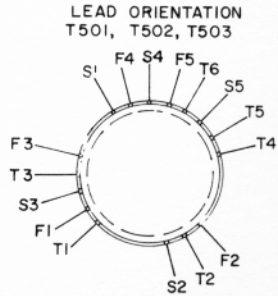




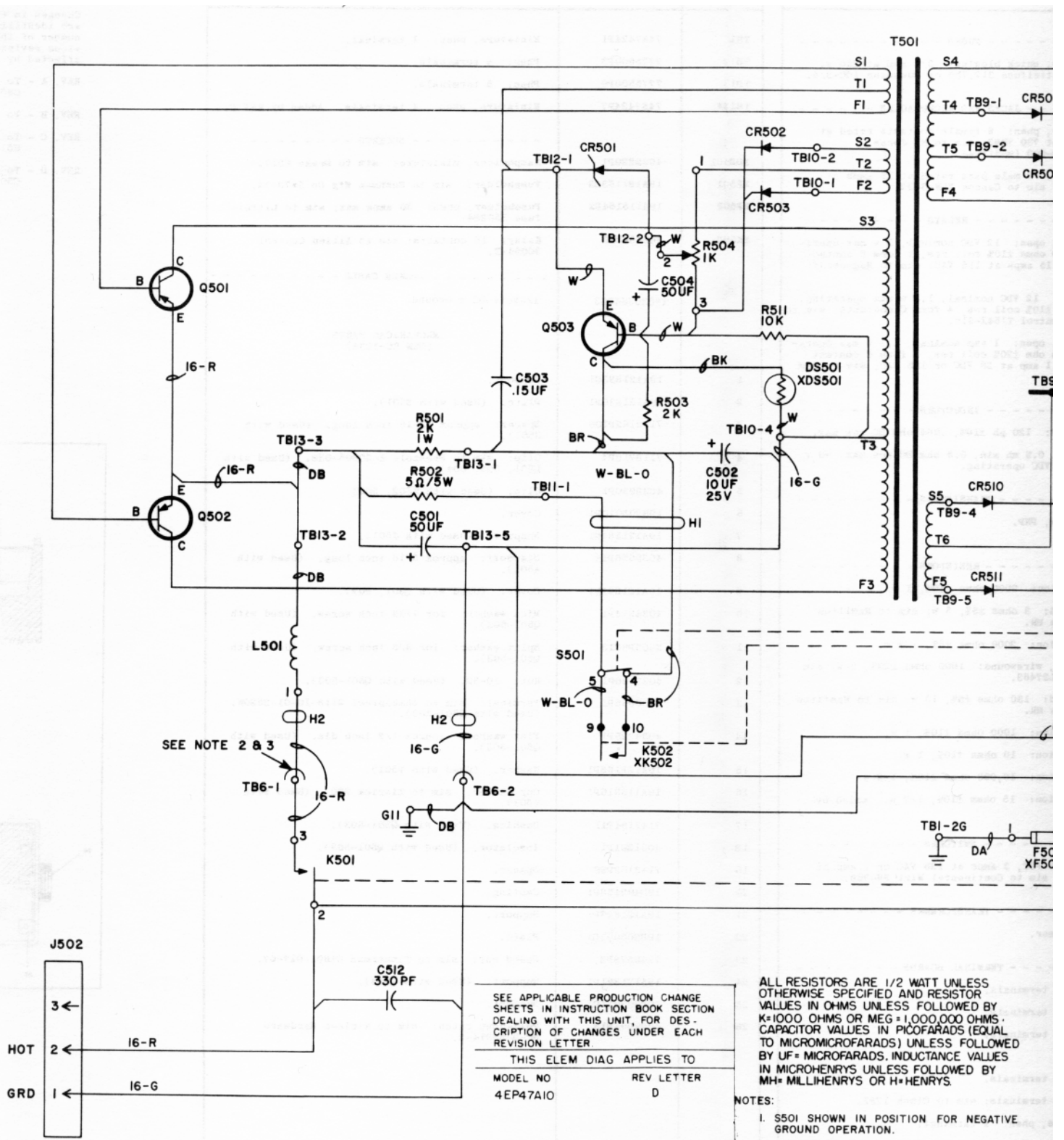




VIEW AT "B"







SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

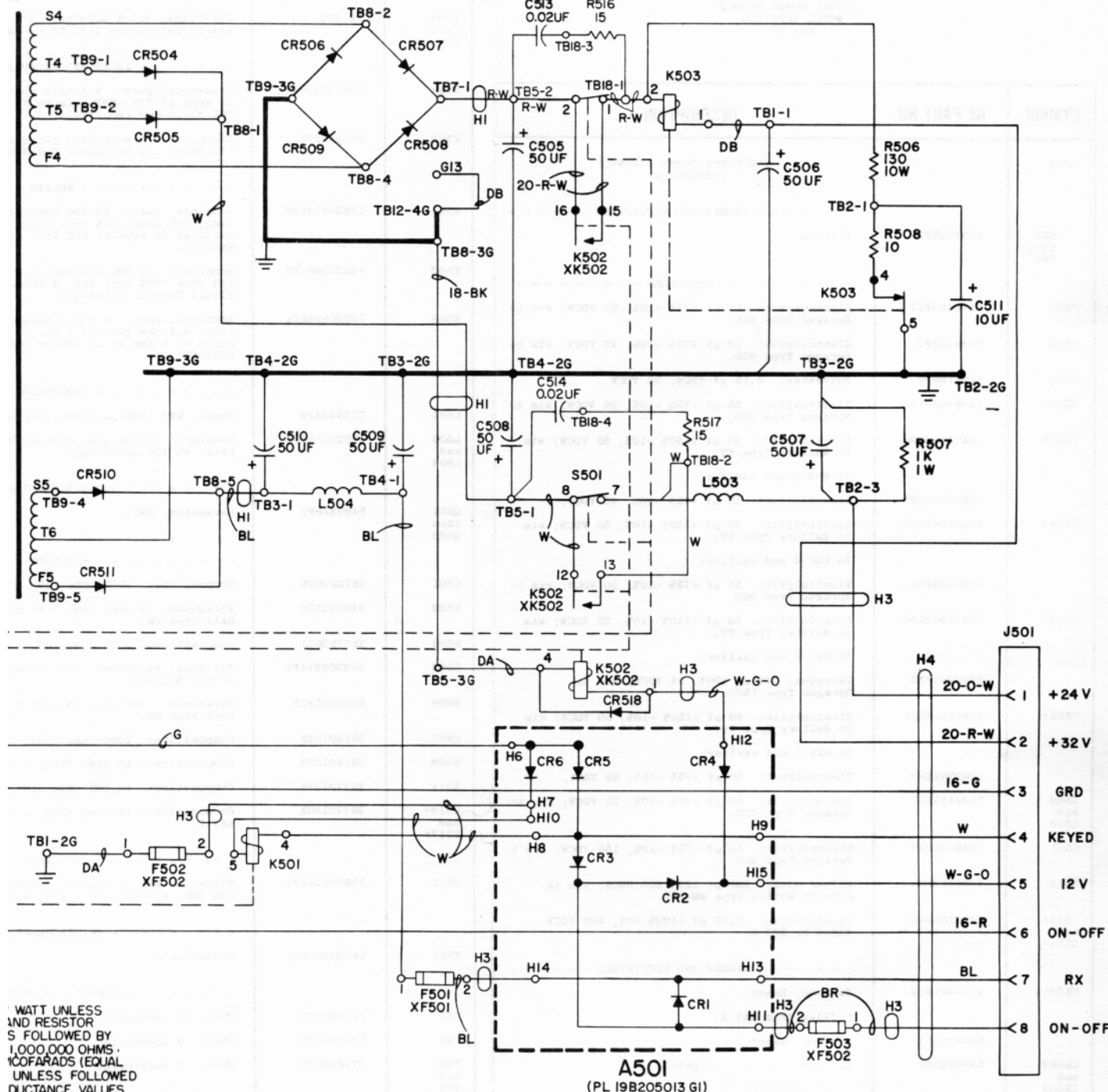
THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
4EP47A10	D

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1,000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

- NOTES:
1. S501 SHOWN IN POSITION FOR NEGATIVE GROUND OPERATION.
  2. INTERCHANGE LEADS AT TB6-1 AND TB6-2 FOR POSITIVE GROUND OPERATION.
  3. TERMINATE #16 G & R WIRES WITH B5490444PI TERMINAL.
  4. ALL WIRES N22 UNLESS OTHERWISE SPECIFIED.

SEE NOTE 2 & 3



WATT UNLESS  
 AND RESISTOR  
 S FOLLOWED BY  
 1,000,000 OHMS  
 100FARADS (EQUAL  
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 DISTANCE VALUES  
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TION FOR NEGATIVE

(19D402524, Rev. 9)

AT TB6-1 AND  
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I R WIRES WITH  
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 ILESS OTHERWISE

**SERVICE SHEET**

12-VOLT, ± GROUND  
 POWER SUPPLY MODEL 4EP47A10  
 PORTA. MOBIL

(RC-1239D)

**PARTS LIST**

LBI-3635C

12 VOLT POWER SUPPLY  
 MODEL 4EP47A11  
 (19D402519-G2)  
 REV D

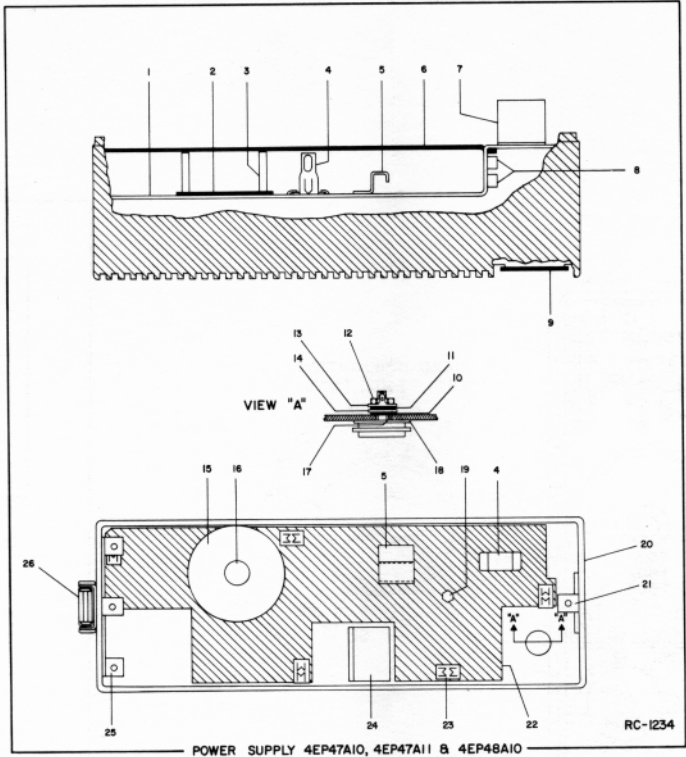
SYMBOL	GE PART NO.	DESCRIPTION
- - - - - CAPACITORS - - - - -		
C501	7489483-P17	Electrolytic: 50 $\mu$ f +75% -10%, 25 VDCW; sim to Sprague 30D186A1.
C502	7489483-P7	Electrolytic: 10 $\mu$ f +75% -10%, 25 VDCW; sim to Sprague 30D182A1.
C503	5491189-P7	Polyester: 0.15 $\mu$ f $\pm$ 20%, 50 VDCW.
C504	7489483-P17	Electrolytic: 50 $\mu$ f +75% -10%, 25 VDCW; sim to Sprague 30D186A1.
C505*	19A115680-P6	Electrolytic: 50 $\mu$ f +150%-10%, 50 VDCW; sim to Mallory Type TT.
	19B209283-P1	In REV B and earlier: Electrolytic: 50 $\mu$ f +75% -10%, 65 VDCW.
C506*	19A115680-P6	Electrolytic: 50 $\mu$ f +150% -10%, 50 VDCW; sim to Mallory Type TT.
	7489483-P25	In REV B and earlier: Electrolytic: 50 $\mu$ f +75% -10%, 50 VDCW; sim to Sprague 30D200A1.
C507*	19A115680-P6	Electrolytic: 50 $\mu$ f +150% -10%, 50 VDCW; sim to Mallory Type TT.
	5496267-P20	In REV B and earlier: Tantalum: 47 $\mu$ f $\pm$ 20%, 35 VDCW; sim to Sprague Type 150D.
C508*	19A115680-P6	Electrolytic: 50 $\mu$ f +150% -10%, 50 VDCW; sim to Mallory Type TT.
	19B209283-P1	In REV B and earlier: Electrolytic: 50 $\mu$ f +75% -10%, 65 VDCW.
C511	7489483-P27	Electrolytic: 10 $\mu$ f +75% -10%, 150 VDCW; sim to Sprague 30D218A1.
C512	7489162-P39	Silver mica: 330 pf $\pm$ 5%, 500 VDCW; sim to Electro Motive Type DM-15.
C515* and C516*	19A115680-P10	Electrolytic: 200 $\mu$ f +150% -10%, 18 VDCW; sim to Mallory Type TT. Added by REV D.
- - - - - DIODES AND RECTIFIERS - - - - -		
CR501*	4036887-P12	Silicon, Zener.
	5496365-P3	In Models earlier than REV A: Silicon, Zener.
CR502 and CR503	5494922-P6	Silicon; sim to Type 1N462.
CR504 thru CR509	4037822-P1	Silicon.
CR514	4037822-P1	Silicon.
CR518	4037822-P1	Silicon.
- - - - - INDICATING DEVICES - - - - -		
DS501	19C307037-P6	Lamp, incandescent: 28 v; sim to GE 1819.
- - - - - FUSES - - - - -		
F501	1R16-P2	Quick blowing: 3/4 amp at 250 v; sim to Littelfuse 312.750 or Bussmann AGC-3/4.
- - - - - JACKS AND RECEPTACLES - - - - -		
J501	19A121226-P1	Receptacle, phen: 8 female contacts; sim to HB Jones 261-32-08-000 (modified).
J502	4034405-P4	Receptacle, polarized: 3 male pins; sim to Cannon XLR-3-32.
- - - - - RELAYS - - - - -		
K501	19B209240-P2	Armature, open: 12 VDC nominal, 2 w max operating, 100 ohms $\pm$ 10% coil res, 1 form C contact; sim to Magnecraft 88X-150A.

\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
K503	19B209249-P1	Armature, open: 1 amp nominal, 1.1 w max operating, 0.5 ohm $\pm 20\%$ coil res, 1 form C contact rated at 1 amp at 28 VDC or 115 VAC; sim to RBM X9559KT.
- - - - - INDUCTORS - - - - -		
L501	7143944-P2	Choke, RF: 120 $\mu$ h $\pm 10\%$ , .064 ohm DC res max.
L503	19B209166-P1	Reactor: 0.9 mh min, 0.5 ohm DC res max, 50 v peak, 50 VDC operating.
L505*	19A115894-P1	Audio freq: 1.0 mh inductance, 0.35 ohms DC res. Added by REV D.
- - - - - TRANSISTORS - - - - -		
Q501 thru Q503	5490810-P1	Germanium, PNP.
- - - - - RESISTORS - - - - -		
R502	5493035-P6	Wirewound: 3 ohms $\pm 5\%$ , 5 w; sim to Tru-Ohm Type X-60.
R503	3R77-P202J	Composition: 2000 ohms $\pm 5\%$ , 1/2 w.
R504	19B209244-P1	Variable, wirewound: 1000 ohms $\pm 20\%$ , 2 w; sim to CTS BL37463.
R506	5493035-P15	Wirewound: 130 ohms $\pm 5\%$ , 10 w; sim to Tru-Ohm Type X-62.
R507	3R78-P102K	Composition: 1000 ohms $\pm 10\%$ , 1 w.
R508	3R78-P100K	Composition: 10 ohms $\pm 10\%$ , 1 w.
R511	3R77-P103K	Composition: 10,000 ohms $\pm 10\%$ , 1/2 w.
- - - - - TRANSFORMERS - - - - -		
T502	19B205009-G2	Transformer.
- - - - - TERMINAL BOARDS - - - - -		
TB2	7775500-P7	Phenolic: 3 terminals.
TB5	7775500-P2	Phenolic: 3 terminals.
TB7	7487424-P1	Miniature, phen: 1 terminal.
TB8 and TB9	7487424-P7	Miniature, phen: 4 terminals.
TB10	7775500-P10	Phenolic: 4 terminals.
TB11	7487424-P1	Miniature, phen: 1 terminal.
TB12	7775500-P3	Phenolic: 4 terminals.
TB13	7775500-P9	Phenolic: 5 terminals.
TB15	7775500-P10	Phenolic: 4 terminals.
TB16*	7775500-P4	Phenolic: 2 terminals. Added by REV D.
TB17*	7775500-P1	Phenolic: 2 terminals. Added by REV D.
- - - - - SOCKETS - - - - -		
XDS501	4032220-P1	Lampholder, miniature: sim to Drake N517.
XF501	19A121163-G3	Fuse clip: sim to Bushman Mfg Co 5678-14.
POWER CABLE ASSEMBLY 19C303640-G3		
	4034405-P3	Plug: 3 sockets; sim to Cannon XLR-3-11C.
	19A115776-P2	Fuseholder: sim to Bussmann Type HHJ.
	7484390-P4	Fuse, quick blowing: 8 amps at 250 v; sim to Bussman ABC-10 or Littelfuse 314008.
	19B209260-P27	Terminal, solderless; sim to Amp 31828.
	19A115776-P4	Contact, electrical: sim to Littelfuse Co 904-87.
MECHANICAL PARTS (SEE RC-1234)		
1	19A121823-G1	Support.
2	19A121830-P1	(Not used).



SYMBOL	GE PART NO.	DESCRIPTION
3	7142162-P100	(Not used).
4	7118719-P4	Clip: sim to Prestole E-50005-038. (Used with L501, 503).
5	4038930-P1	Clip. (Used with R502, 506).
6	19B205010-P1	Cover.
7	19A121181-G1	Support. (Used with J501).
8	4035656-P14	(Not used).
9	19A121822-P1	Cover. (Used with Q501, 502).
10	4034214-P1	Mica washer: for 7/32 inch screw. (Used with Q501-503).
11	N405P9C13	Split washer: for 3/8 inch screw. (Used with Q501-503).
12	4032596-P1	Nut: 10-32. (Used with Q501-503).
13	4036835-P1	Terminal: sim to Shakeproof 2118-10-01-2520N. (Used with Q501-503).
14	4034225-P1	Flat washer: 10-32. (Used with Q501-503).
15	19A121168-P1	Washer. (Used with T501).
16	19A115316-P1	Cup washer: sim to Zierick 220. (Used with T501).
17	7147194-P11	Bushing. (Used with Q501-503).
18	4031291-P1	Insulator. (Used with Q501-503).
19	7142162-P99	Spacer.
20	19D402428-P1	Casting.
21	19A121825-P1	Support.
22	19B205007-G1	Plate.
23	7140578-P2	Speed nut: sim to Tinnerman C1691-017-67.
24	19A121821-P1	Support. (Used with Q503).
25	19B205011-G1	Support.
26	4029994-P3	Pull-down catch: sim to Nielsen Hardware SC-B-83314-2.



## PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

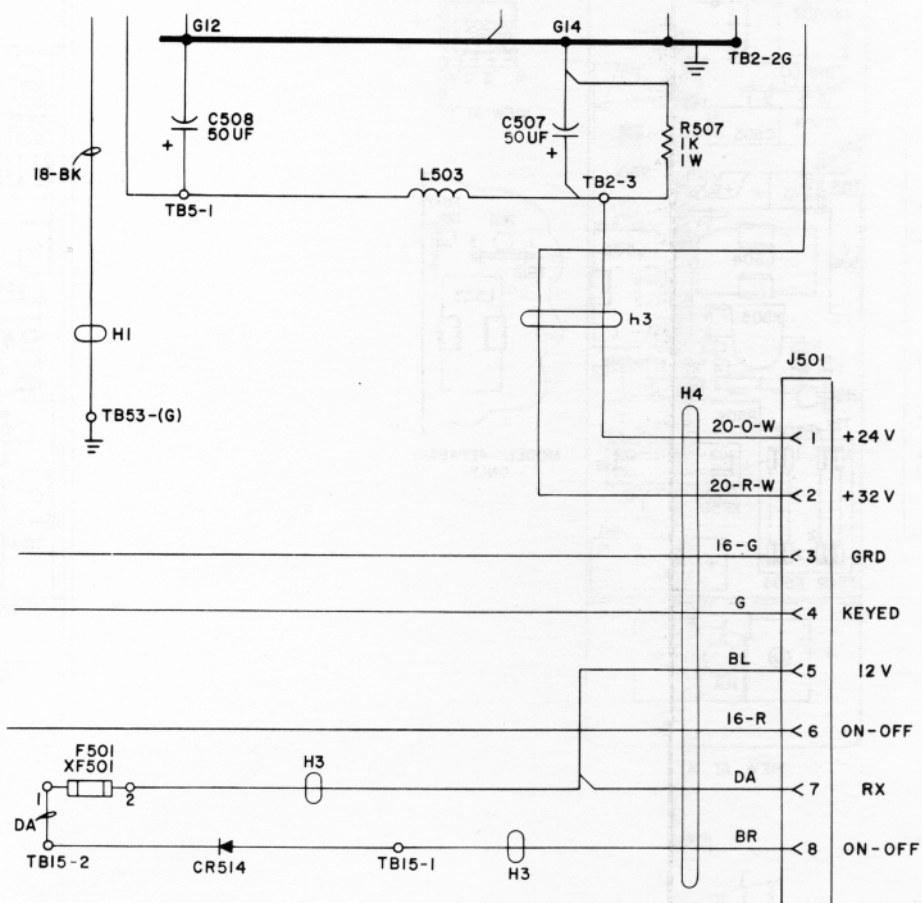
REV. A - To incorporate a more readily available component. Changed CR501.

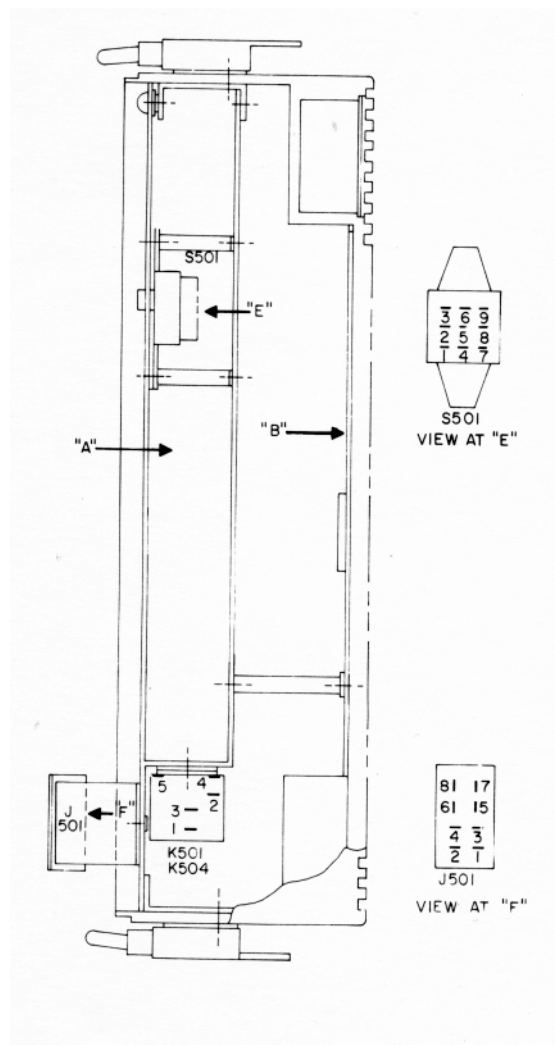
REV. B - To provide relay arc suppression. Added CR518.

REV. C - To improve filtering at low temperatures.  
Changed C505, C506, C507 and C508.

REV. D - To reduce alternator noise. Added C515, C516 and L505.

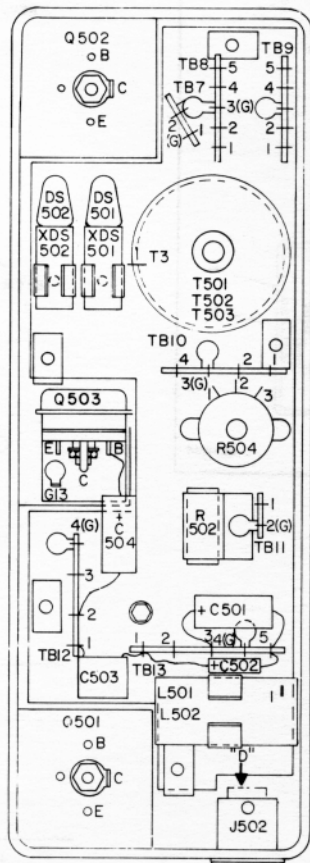
SCHEMATIC DIAGRAM WAS:



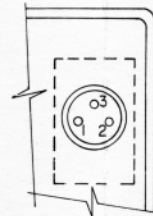
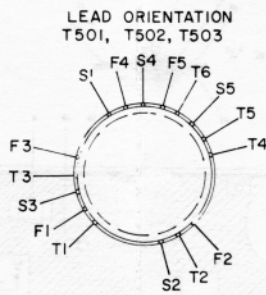




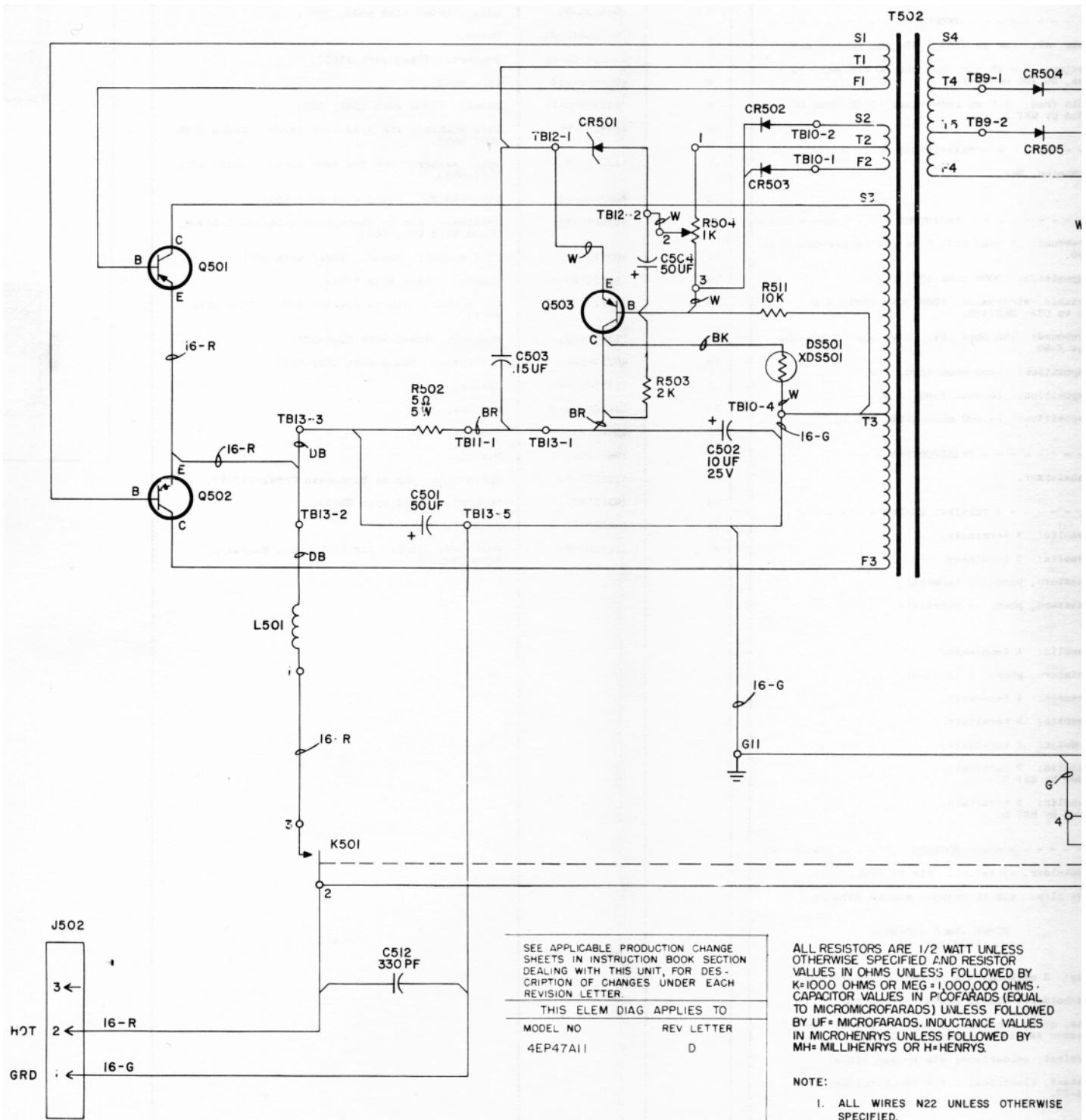




VIEW AT "B"



J502  
VIEW AT "D"



SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
4EP47A11	D

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICO FARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

NOTE:  
1. ALL WIRES N22 UNLESS OTHERWISE SPECIFIED.





**PARTS LIST**

LBI-3636D

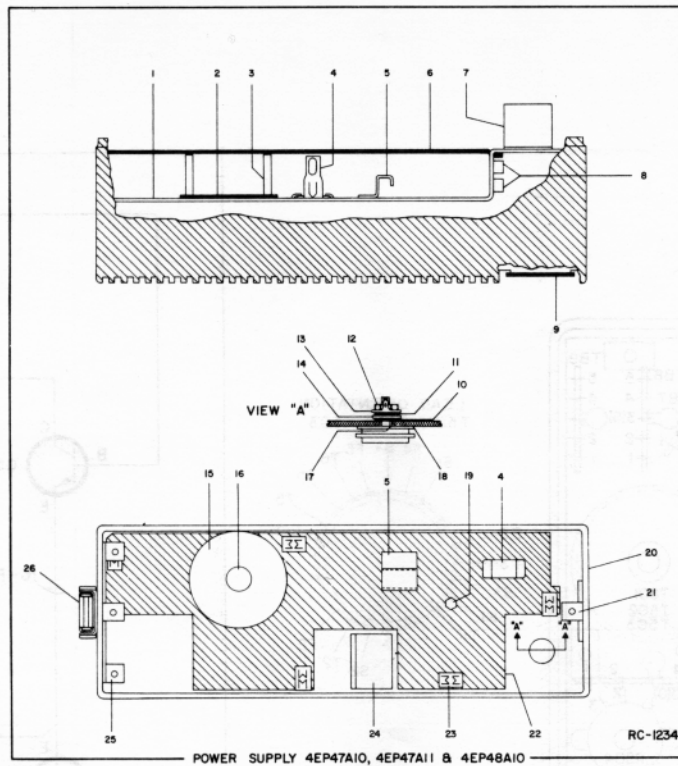
6-VOLT POWER SUPPLY  
MODEL 4EP48A10  
(19D402519G3)

SYMBOL	GE PART NO.	DESCRIPTION
- - - - - CAPACITORS - - - - -		
C501	7489483P17	Electrolytic: 50 $\mu$ f +75%-10%, 25 VDCW; sim to Sprague 30D.
C502	7489483P7	Electrolytic: 10 $\mu$ f +75%-10%, 25 VDCW; sim to Sprague 30D.
C503	19A116080P8	Polyester: 0.15 $\mu$ f $\pm$ 20%, 50 VDCW.
C504	7489483P17	Electrolytic: 50 $\mu$ f +75%-10%, 25 VDCW; sim to Sprague 30D.
C505*	19A115680P6	Electrolytic: 50 $\mu$ f +150%-10%, 50 VDCW; sim to Mallory Type TT.  In REV D and earlier:
	19B209283P1	Electrolytic: 50 $\mu$ f +75%-10%, 65 VDCW.
C506*	19A115680P6	Electrolytic: 50 $\mu$ f +150%-10%, 50 VDCW; sim to Mallory Type TT.  In REV D and earlier:
	7489483P25	Electrolytic: 50 $\mu$ f +75%-10%, 50 VDCW; sim to Sprague 30D.
C507*	19A115680P6	Electrolytic: 50 $\mu$ f +150%-10%, 50 VDCW; sim to Mallory Type TT.  In REV D and earlier:
	5496267P20	Tantalum: 47 $\mu$ f $\pm$ 20%, 35 VDCW; sim to Sprague Type 150D.
C508*	19A115680P6	Electrolytic: 50 $\mu$ f +150%-10%, 50 VDCW; sim to Mallory Type TT.  In REV D and earlier:
	19B209283P1	Electrolytic: 50 $\mu$ f +75%-10%, 65 VDCW.
C509 and C510	7489483P17	Electrolytic: 50 $\mu$ f +75%-10%, 25 VDCW; sim to Sprague 30D.
C511	7489483P27	Electrolytic: 10 $\mu$ f +75%-10%, 150 VDCW; sim to Sprague 30D.
C512	7489162P39	Silver mica: 330 pf $\pm$ 5%, 500 VDCW; sim to Electro Motive Type DM-15.
- - - - - DIODES AND RECTIFIERS - - - - -		
CR502 and CR503	5494922P6	Silicon; sim to Type 1N462.
CR504 thru CR513	4037822P1	Silicon.
CR515* and CR516*	4036887P51	Silicon, Zener.  In REV E and earlier:
	4036887P5	Silicon, Zener.
CR517*	4037822P1	Silicon. Added by REV A. Deleted by REV C.
CR518*	4037822P1	Silicon. Added by REV B.
CR519*	19A115528P6	Silicon, Zener. Added by REV C.
CR520*	4037822P1	Silicon. Added by REV D.
- - - - - INDICATING DEVICES - - - - -		
DS501	19C307037P6	Lamp, incandescent: 28 v; sim to GE 1819.
DS502	19C307037P5	Lamp, incandescent: 28 v; sim to GE 1829.
- - - - - FUSES - - - - -		
F501 thru F503	1R16P2	Quick blowing: 3/4 amp at 250 v; sim to Littelfuse 312.750 or Bussmann AGC-3/4.

\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
----- JACKS AND RECEPTACLES -----		
J501	19A121226P1	Receptacle, phen: 8 female contacts; sim to HB Jones 261-32-08-000 (modified).
J502	4034405P4	Receptacle, polarized: 3 male pins; sim to Cannon XLR-3-32.
----- RELAYS -----		
K502	19C300957P2	Armature, enclosed: 185 ohms $\pm 10\%$ coil res, 12 VDC, 1.5 w, 4 form C contacts; sim to Allied Control T154X-316.
K503	19B209249P1	Armature, open: 1 amp nominal, 1.1 w max operating, 0.5 ohm $\pm 20\%$ coil res, 1 form C contact; sim to RBM X9559KT.
K504	19B209240P1	Armature, open: 6 VDC nominal, 2 w max operating, 25 ohms $\pm 10\%$ coil res, 1 form C contact; sim to Magnecraft 88X-149.
----- INDUCTORS -----		
L502	19A115392P1	Choke, RF: 50 $\mu$ h $\pm 10\%$ , .02 ohm DC res max.
L503 and L504	19B209166P1	Reactor: 0.9 mh min, 0.5 ohm DC res max, 50 VDC operating.
----- TRANSISTORS -----		
Q501 thru Q503	5490810P1	Germanium, PNP.
Q504*	19A116118P3	Silicon, NPN. In REV F and earlier:
	19A115527P1	Silicon, NPN. Added by REV C.
----- RESISTORS -----		
R502*	5493035P6	Wirewound: 3 ohms $\pm 5\%$ , 5 w; sim to Tru-Ohm Type X-60. In Models of REV B or earlier:
	5493035P1	Wirewound: 5 ohms $\pm 5\%$ , 5 w; sim to Tru-Ohm Type X-60.
R504	19B209244P1	Variable, wirewound: 1000 ohms $\pm 20\%$ , 2 w; sim to CTS Type 117.
R506	5493035P15	Wirewound: 130 ohms $\pm 5\%$ , 10 w; sim to Tru-Ohm Type X-62.
R507	3R78P102K	Composition: 1000 ohms $\pm 10\%$ , 1 w.
R508	3R78P100K	Composition: 10 ohms $\pm 10\%$ , 1 w.
R510	3R78P301J	Composition: 300 ohms $\pm 5\%$ , 1 w.
R512	3R77P102K	Composition: 1000 ohms $\pm 10\%$ , 1/2 w.
R513*	5493035P17	Wirewound: 63 ohms $\pm 5\%$ , 5 w; sim to Tru-Ohm Type X-60. Added by REV A. Deleted by REV C.
R514*	3R78P221J	Composition: 220 ohms $\pm 5\%$ , 1 w. Added by REV C.
R515*	3R77P102J	Composition: 1000 ohms $\pm 5\%$ , 1/2 w. Added by REV C.
----- TRANSFORMERS -----		
T503*	19B205009G4	Transformer. In Models of REV B or earlier:
	19B205009G3	Transformer.
----- TERMINAL BOARDS -----		
TB1	7775500P1	Phen: 2 terminals.
TB2	7775500P7	Phen: 3 terminals.
TB4	7775500P1	Phen: 2 terminals.
TB5	7775500P2	Phen: 3 terminals.
TB6	7117710P2	Phen: 2 terminals; sim to Cinch 1781.
TB7	7487424P1	Miniature, phen: 1 terminal.
TB8 and TB9	7487424P7	Miniature, phen: 4 terminals.
TB10	7775500P10	Phen: 4 terminals.

SYMBOL	GE PART NO.	DESCRIPTION
TB11	7487424P1	Miniature, phen: 1 terminal.
TB12	7775500P3	Phen: 4 terminals.
TB13	7775500P9	Phen: 5 terminals.
TB14	7487424P5	Miniature, phen: 3 terminals.
TB16*	7775500P7	Phen: 4 terminals. Added by REV C.
TB17*	7487424P22	Miniature, phen: 1 terminal. Added by REV A.
		----- SOCKETS -----
XDS501 and XDS502	4032220P1	Lampholder: sim to Drake N517.
XF501	19A121163G3	Fuse clip; sim to Bussman Mfg Co 5678-14.
XF502	19A115164P2	Fuseholder, phen: 30 amps max; sim to Littelfuse 350284.
XK502	5491595P5	Relay: 16 contacts; sim to Allied Control 30054-2.
		POWER CABLE ASSEMBLY 19C303640G4
	4034405P3	Plug: 3 sockets; sim to Cannon XLR-3-11C.
	19A115776P2	Fuseholder: sim to Bussmann Type HHJ.
	7484390P3	Fuse, quick blowing: 15 amps at 250 v; sim to Bussman ABC-15 or Littelfuse 314015.
	19B209260P27	Terminal, solderless; sim to Amp 31828.
	19A115776P4	Contact, electrical: sim to Littelfuse Co 904-87.
		MECHANICAL PARTS (SEE RC-1234)
1	19A121823G1	Support.
2	19A121830P1	(Not Used).
3	7142162P100	(Not Used).
4	7118719P4	Clip: sim to Prestole E-50005-038. (Used with L503, 504).
5	4038930P1	Clip. (Used with R502, 506).
6	19B205010P1	Cover.
7	19A121181G1	Support. (Used with J501).
8	4035656P14	(Not Used).
9	19A121822P1	Cover. (Used with Q501, 502).
10	4034214P1	Mica washer: for 7/32 inch screw. (Used with Q501-503).
11	N405P9C13	Split washer: for 3/8 inch screw. (Used with Q501-503).
12	4032596P1	Nut: 10-32. (Used with Q501-503).
13	4036835P1	Terminal: sim to Shakeproof 2118-10-01-2520N. (Used with Q501-503).
14	4034225P1	Flat washer: approx 1/2 inch dia. (Used with Q501-503).
15	19A121168P1	Washer: approx 2 inches dia. (Used with T501).
16	19A115316P1	Cup washer: approx 9/16 inch dia; sim to Zierick 220. (Used with T501).
17	7147194P11	Bushing: approx 1/8 x 1/4 inch dia. (Used with Q501-503).
18	4031291P1	Insulator. (Used with Q501-503).
19	7142162P99	Spacer: approx 1-5/16 inches long.
20	19D402428P1	Casting.
21	19A121825P1	Support.
22	19B205007G1	Plate.
23	7140578P2	(Not Used).
24	19A121821P1	Support. (Used with Q503).
25	19B205011G1	Support.
26	4029994P3	Pull-down catch: sim to Nielsen Hardware SC-B-83314-2.

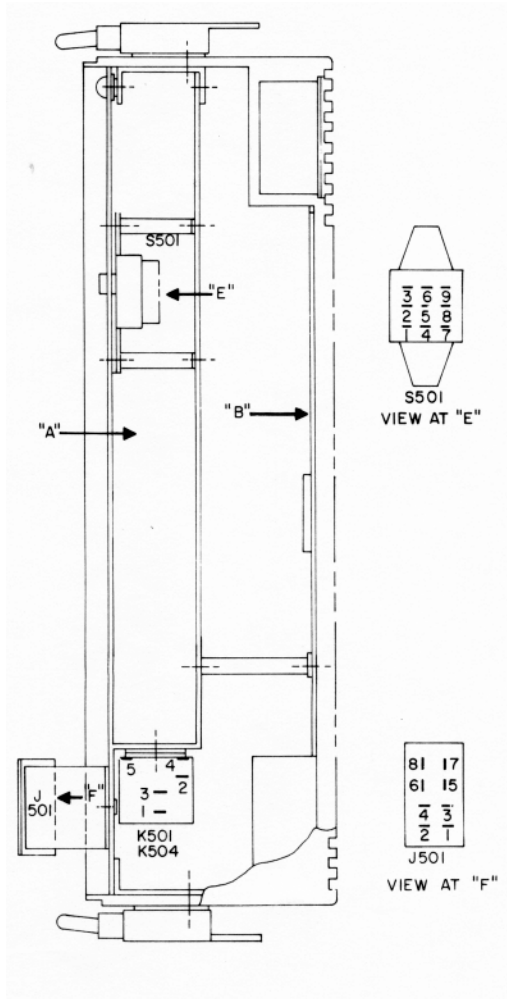


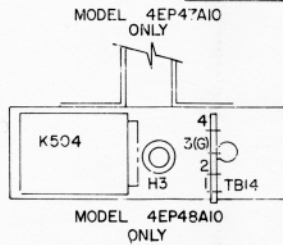
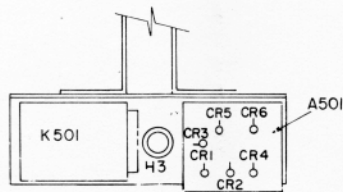
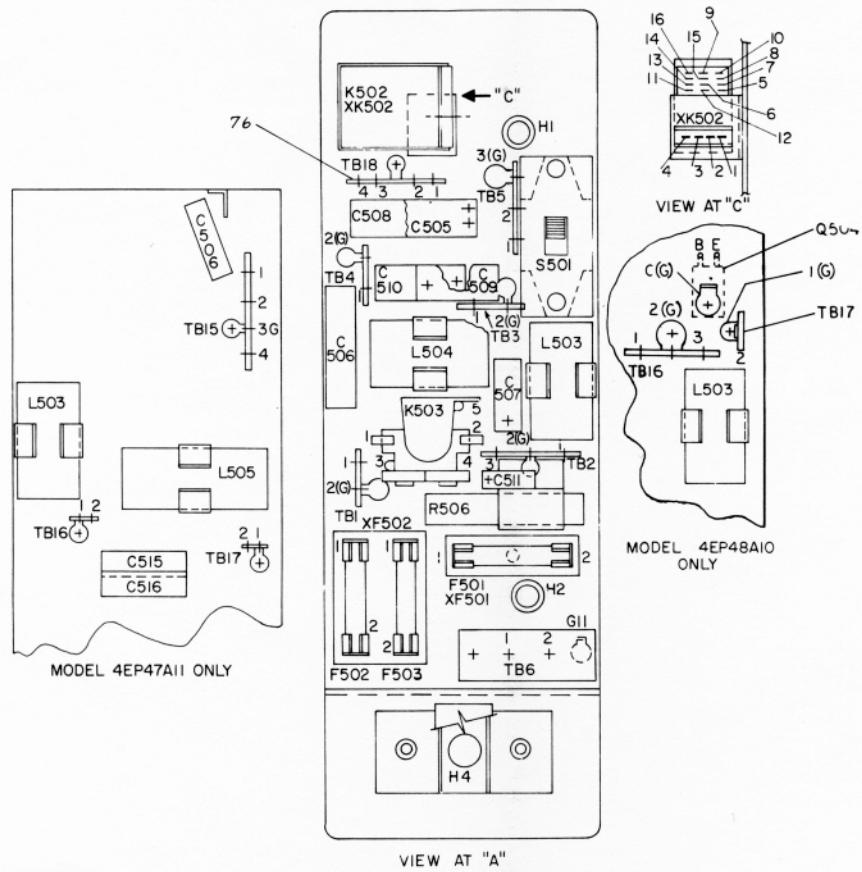
## PRODUCTION CHANGES

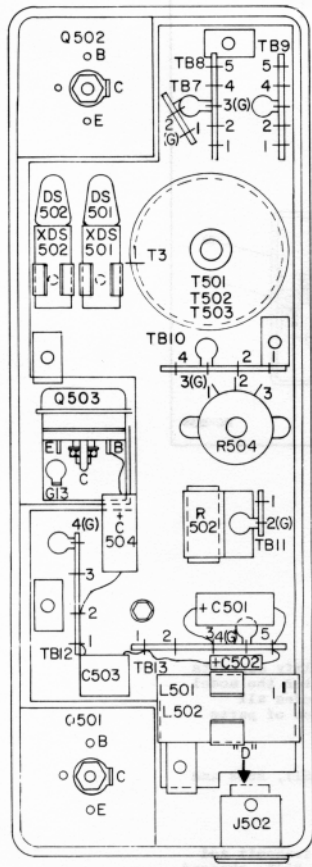
Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for description of parts affected by these revisions.

- REV. A - To improve performance of tone squelch. Added CR517, R513 and TB17.
- REV. B - To provide relay arc suppression. Added CR518.
- REV. C - To provide a more stable 12-Volt supply for both transmit and receive conditions. Added CR519, Q504, R514, and R515; changed R502 and T503; and deleted CR517 and R513.
- REV. D - To isolate transmitter from 12 Volt supply during receive operation. Added CR520.
- REV. E - To improve filtering at low temperatures - Changed C505, C506, C507 and C508.
- REV. F - To increase output voltage adjustment range. Changed CR515 and CR516.
- REV. G - To incorporate new transistor. Changed Q504.

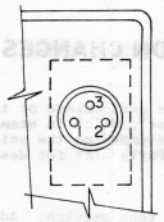
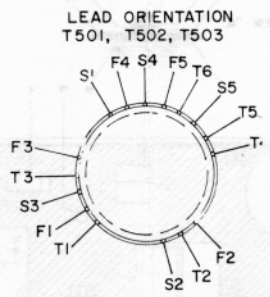




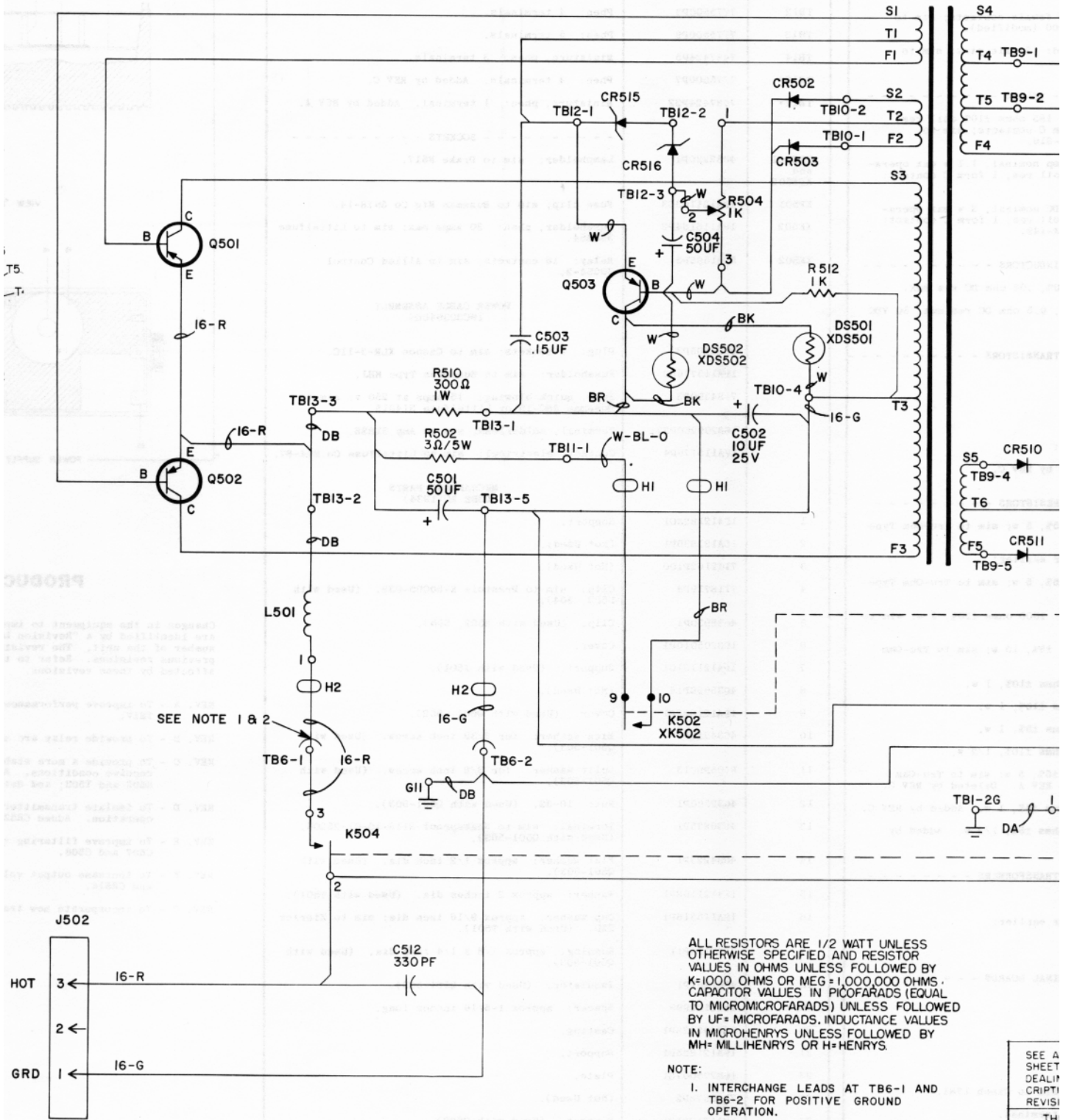




VIEW AT "B"



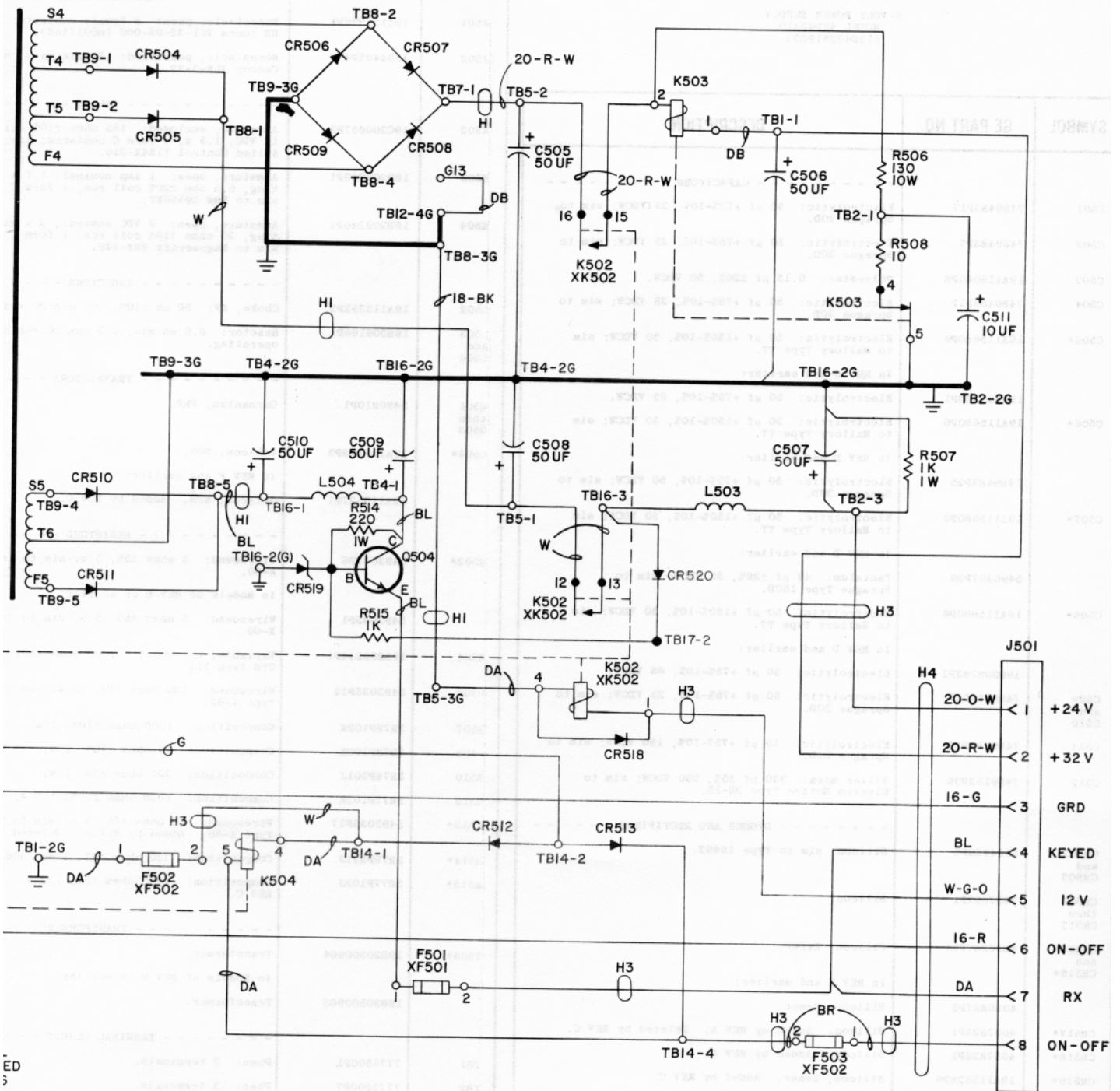
VIEW AT "D"



ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MILLIHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

- NOTE:
1. INTERCHANGE LEADS AT TB6-1 AND TB6-2 FOR POSITIVE GROUND OPERATION.
  2. TERMINATE #16 G & R WIRES WITH B5490444PI TERMINAL.
  3. ALL WIRES N22 UNLESS OTHERWISE SPECIFIED.

SEE A SHEET DEALIN CRPTI REVISI
TH
MODEL
4EP4



SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
4EP48A10	G

**SERVICE SHEET**

6-VOLT, ± GROUND  
POWER SUPPLY MODEL 4EP48A10

(RC-1240E)



PARTS LIST

LBI-3707C

24/36 VOLT POWER SUPPLY  
MODEL 4EP52A10  
(19D402673G1)

SYMBOL	GE PART NO.	DESCRIPTION
----- CAPACITORS -----		
C501 and C502	19A115028P19	Polyester: 0.47 $\mu$ f $\pm$ 20%, 100 VDCW.
C503	5493132P9	Electrolytic: 500 $\mu$ f +100%-10%, 50 VDCW; sim to Sprague 44D.
C504	19A115680P4	Electrolytic: 50 $\mu$ f +150%-10%, 25 VDCW; sim to Mallory Type TT.
C505	19A115028P411	Polyester: .047 $\mu$ f $\pm$ 5%, 200 VDCW.
C506	19B209243P1	Polyester: .01 $\mu$ f $\pm$ 20%, 50 VDCW.
C507 and C508	19A115680P9	Electrolytic: 120 $\mu$ f +150%-10%, 26 VDCW; sim to Mallory Type TT.
C509	5496267P17	Tantalum: 1 $\mu$ f $\pm$ 20%, 35 VDCW; sim to Sprague Type 150D.
C510	7489483P4	Electrolytic: 50 $\mu$ f +75%-10%, 6 VDCW; sim to Sprague 30D133A1.
C511 and C512	19A115680P6	Electrolytic: 50 $\mu$ f +150% -10%, 50 VDCW; sim to Mallory Type TT.
C513 and C514	19A115680P9	Electrolytic: 120 $\mu$ f +150%-10%, 26 VDCW; sim to Mallory Type TT.
C515 and C516	19A115680P10	Electrolytic: 200 $\mu$ f +150% -10%, 18 VDCW; sim to Mallory Type TT.
C517	7161189P2	Ceramic disc: 0.1 $\mu$ f +80% -30%, 50 VDCW; sim to Sprague 36C172.
C518	5494481P13	Ceramic disc: 2000 pf $\pm$ 20%, 1000 VDCW; sim to RMC Type JF Discap.
C519	7774750P15	Ceramic disc: .02 $\mu$ f +100% -0%, 500 VDCW.
C520	7489162P39	Silver mica: 330 pf $\pm$ 5%, 500 VDCW; sim to Electro Motive Type DM-15.
C521*	19A116080P107	Polyester: 0.1 $\mu$ f $\pm$ 10%, 50 VDCW. Added by REV B.
C522*	19A115680P3	Electrolytic: 20 $\mu$ f +150% -10%, 25 VDCW; sim to Mallory Type TT. Added by REV C.
C523* and C524*	19A116080P7	Polyester: 0.1 $\mu$ f $\pm$ 20%, 50 VDCW. Added by REV C.
----- DIODES AND RECTIFIERS -----		
CR501	4037822P1	Silicon.
CR502*	19A115823P1	Silicon. Earlier than REV A:
	19A115557P1	Silicon.
CR503 thru CR512	4037822P1	Silicon.
SCR501	19A115747P1	Silicon controlled.
----- JACKS AND RECEPTACLES -----		
J501	19A121226P1	Connector, phen: 8 female contacts; sim to HB Jones 261-32-08-000 (modified).
J502	4034405P4	Receptacle: 3 male pins; sim to Cannon Electric XLR-3-32.
----- RELAYS -----		
K501	19B209240P6	Armature, open: 20 VDC nominal, 400 ohms $\pm$ 10% coil res, 3 form C contacts; sim to Magnecraft 88X-202.

\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
		----- INDUCTORS -----
L501 and L502	7143944P2	Choke, RF: 120 $\mu$ h $\pm$ 10%, .064 ohm DC res max.
L503	19B206285G1	Choke. 10 mh.
L504	19A115686P1	Reactor: 2.5 mh min, 0.5 ohm DC res max, 20 VDC operating.
L505 and L506	19A115743P1	Reactor: 10 mh min, 1.2 ohms DC res max, 24 VDC operating.
		----- TRANSISTORS -----
Q501	19A115531P1	Germanium, PNP; sim to Type 2N1073B.
Q502	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q503	19A115300P1	Silicon, NPN; sim to Type 2N3053.
Q504* and Q505*	19A116784P1	Germanium, PNP; sim to Type 2N1551.
		In REV D and earlier:
	19A115561P1	Germanium, PNP.
Q506	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q507	19A115364P1	Silicon; sim to Type 2N2646.
Q508	19A115562P1	Silicon, PNP.
		----- RESISTORS -----
R501 and R502	3R77P272K	Composition: 2700 ohms $\pm$ 10%, 1/2 w.
R503	3R77P271K	Composition: 270 ohms $\pm$ 10%, 1/2 w.
R504	5493035P9	Wirewound: 300 ohms $\pm$ 5%, 5 w; sim to Hamilton Hall Type HR.
R505 thru R507	3R77P302J	Composition: 3000 ohms $\pm$ 5%, 1/2 w.
R508	19A115681P1	Variable, wirewound: 1000 ohms $\pm$ 20%, 3 w; sim to CTS Series 115.
R509	3R77P101K	Composition: 100 ohms $\pm$ 10%, 1/2 w.
R510	3R77P330J	Composition: 33 ohms $\pm$ 5%, 1/2 w.
R511	3R78P102K	Composition: 1000 ohms $\pm$ 10%, 1 w.
R512	3R77P821K	Composition: 820 ohms $\pm$ 10%, 1/2 w.
R513	19A115681P2	Variable, wirewound: 5000 ohms $\pm$ 20%, 3 w; sim to CTS Series 115.
R514	3R77P331J	Composition: 330 ohms $\pm$ 5%, 1/2 w.
R515	3R77P301J	Composition: 300 ohms $\pm$ 5%, 1/2 w.
R516	3R77P561K	Composition: 560 ohms $\pm$ 10%, 1/2 w.
R517	3R77P103K	Composition: 10,000 ohms $\pm$ 10%, 1/2 w.
R518	5495948P217	Deposited carbon: 1470 ohms $\pm$ 1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R519	5493035P23	Wirewound: 2 ohms $\pm$ 5%, 7 w; sim to Hamilton Hall Type HR.
R520	3R77P300J	Composition: 30 ohms $\pm$ 5%, 1/2 w.
R521	3R77P102K	Composition: 1000 ohms $\pm$ 10%, 1/2 w.
R522*	19A116559P4	Variable, cermet: 2500 ohms $\pm$ 20%, 1/2 w; sim to CTS Series 360.
		In REV D and earlier:
	5495948P205	Deposited carbon: 1100 ohms $\pm$ 1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R523	19B209022P123	Wirewound: 2.2 ohms $\pm$ 10%, 2 w; sim to IRC Type BWH.
R524*	3R152P102K	Composition: 1000 ohms $\pm$ 10%, 1/4 w. Added by REV E.
		----- TRANSFORMERS -----
T501	19B205428G1	Transformer.
		----- TERMINAL BOARDS -----
TB1	7775500P3	Phen: 4 terminals.

SYMBOL	GE PART NO.	DESCRIPTION
TB2	7775500P7	Phen: 3 terminals.
TB3	7775500P55	Phen: 5 terminals.
TB4	7775500P8	Phen: 4 terminals.
TB5 thru TB10	7775500P7	Phen: 3 terminals.
TB11	7775500P4	Phen: 2 terminals.
----- VOLTAGE REGULATORS -----		
VR501	4036887P7	Silicon, Zener.
VR502*	4036887P47	Silicon, Zener.
		Earlier than REV D:
	4036887P7	Silicon, Zener.
VR503	4036887P8	Silicon, Zener.
POWER CABLE 19B205422G1		
	19A115067P1	Cable, 2 conductor: approx 10 feet; sim to Belden 31713.
	19A116776P2	Phenolic: sim to Bussman Type HHJ.
	1R16P7	Cartridge, quick blowing: 4 amps at 250 v; sim to Littelfuse 312004 or Bussman MTH-4.
	4034405P3	Plug: 3 sockets; sim to Cannon Electric XLR-3-11C.
POWER CABLE 19B205422G2		
	19A115067P1	Cable, 2 conductor: approx 23 feet; sim to Belden 31713.
	19A116776P2	Phenolic: sim to Bussman Type HHJ.
	1R16P7	Cartridge, quick blowing: 4 amps at 250 v; sim to Littelfuse 312004 or Bussman MTH-4.
	4034405P3	Plug: 3 sockets; sim to Cannon Electric XLR-3-11C.
MECHANICAL PARTS (SEE RC-1344)		
1	4029994P3	Pull-down catch: sim to Nielsen Hardware SC-B-83314-2.
2	19B205413P1	Chassis.
3	19B205010P1	Cover.
4	19A121822P1	Cover. (Used with Q501, 505).
5	4029974P1	Transistor insulator. (Used with Q501, 504, 505).
6	7118719P5	Clip: sim to Prestole E-50007-038. (Holds C503).
7	19A122279P1	Heat sink. (Used with Q504).
8	7118719P4	Clip: sim to Prestole E-50005-038. (Holds L501-502).
9	19D402428P2	Casting.
10	N404P25C13	Lockwasher. (For 1/4 screw).
11	19A115276P2	Insulated washer: mica.
12	4033714P2	Terminal: sim to Zierick 110.
13	19A115275P2	Insulated washer: Teflon.
14	N402P11C13	Plainwasher. (For 1/4 screw).
15	N210P20C13	Nut: 1/4 - 28.

## **PRODUCTION CHANGES**

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - To place part no longer available. Changed CR502.

REV. B - To reduce receiver noise at minimum volume. Added C521 between H35 and H36.

REV. C - To insure proper operation of circuit with transistors from different vendors. Added C522, C523 and C524.

REV. D - To compensate for component tolerances. Changed VR502.

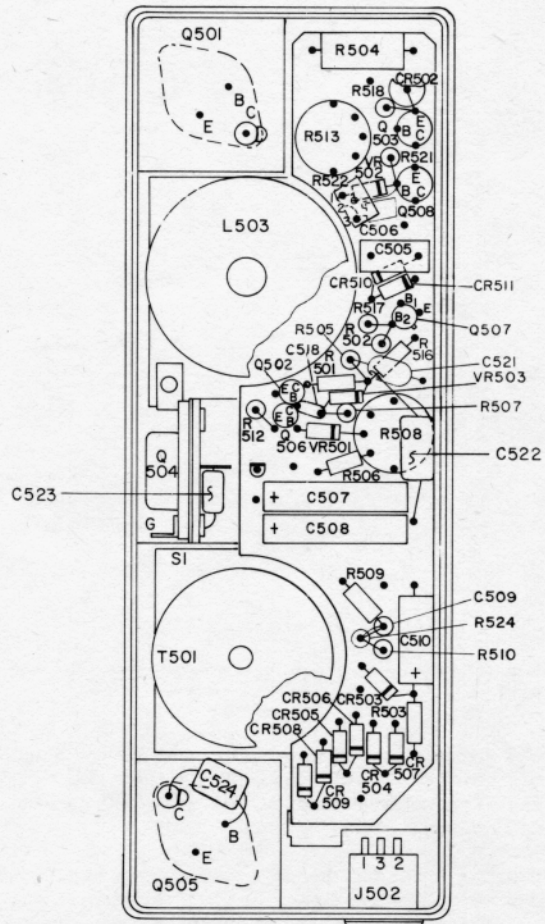
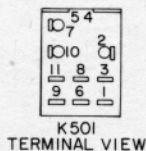
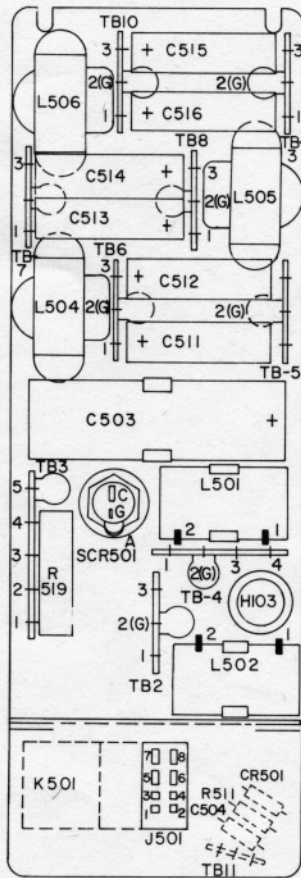
REV. E - To reduce transistor failures and improve starting performance in cold temperatures. Changed Q504, Q505, and R522. Added R524.

# TROUBLESHOOTING PROCEDURES

SYMPTOM	CHECK FOR THE FOLLOWING
No power supply output.	1. Open fuse (if replaced fuse blows instantly, check Q501 through Q505, Q508, SCR501, and R502 for shorts). 2. Correct polarity input. 3. Open CR501. 4. Shorted filter capacitors C503, C504, C511, C512, C513, and C514.
Output voltages low.	Shorted VR501.
Output voltages high.	Open SCR501, Q508, or VR502.
No +12 volts at J501-7. Other voltages OK.	Open L506, CR508, or CR509.
No +32 volts at J501-2. Other voltages OK.	Open L504, CR504, or CR507.
No +24 volts at J501-1. Other voltages OK.	Open L505, CR505, or CR506.

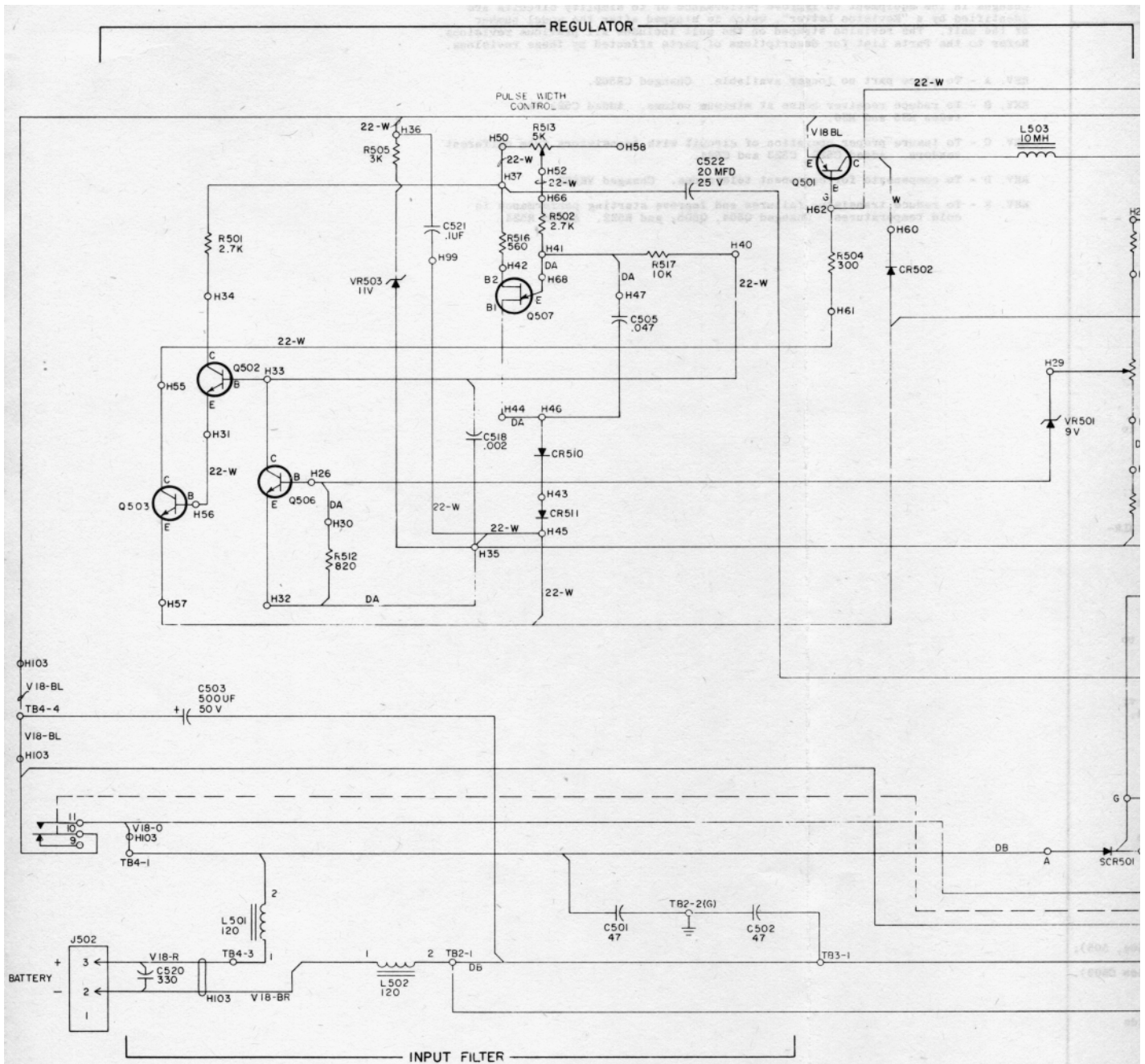
NOTE - After replacing a defective Q501, check CR503, R503, and CR502 for opens and check for approximately 3-volts across C510.

## OUTLINE DIAGRAM



(19C311119, Rev. 4)



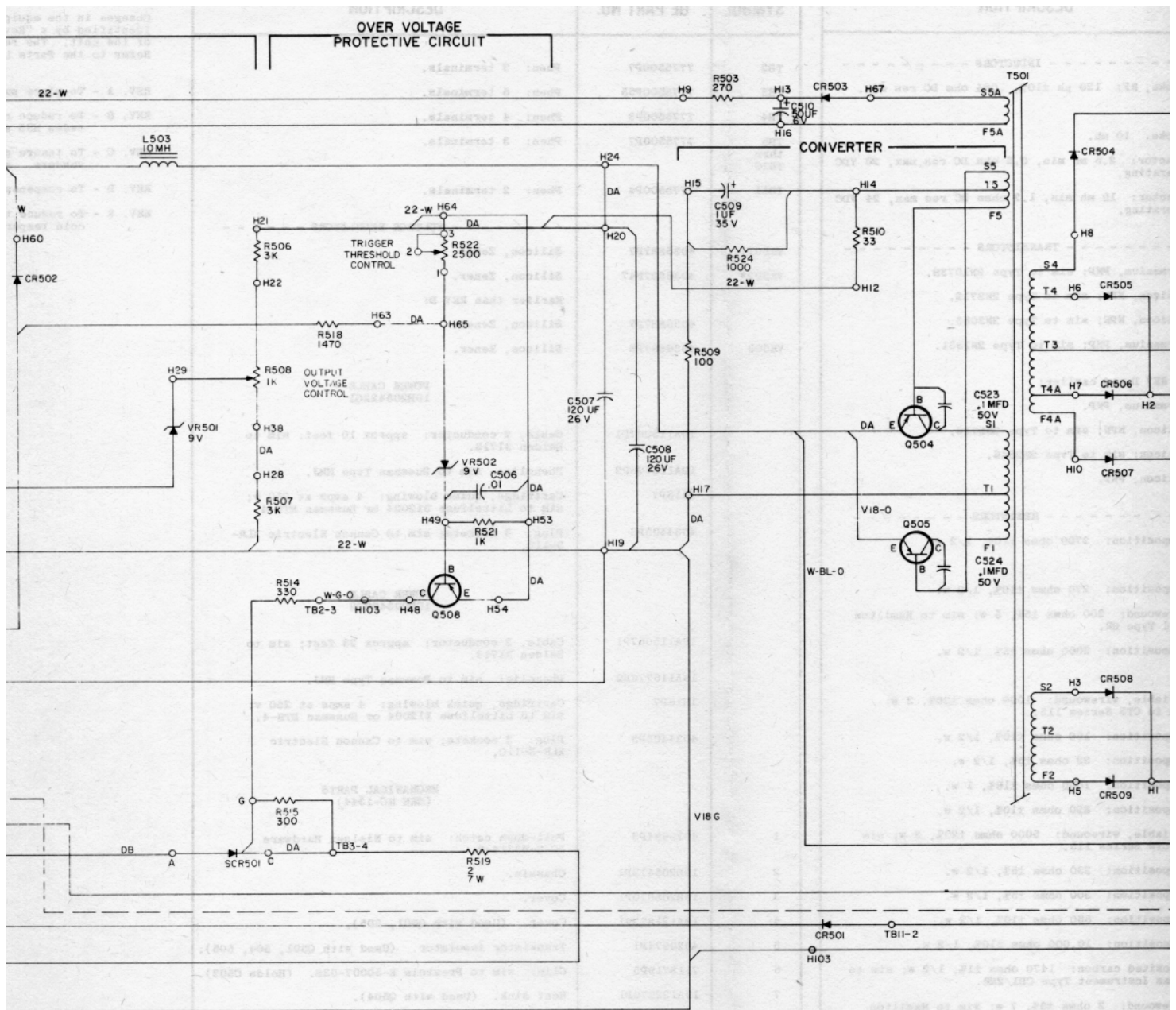


## ADJUSTMENT

Output Voltage Control R508, Pulse Width Control R513 and Trigger Threshold Control R522 are pre-set at the factory and should be adjusted only under the following conditions.

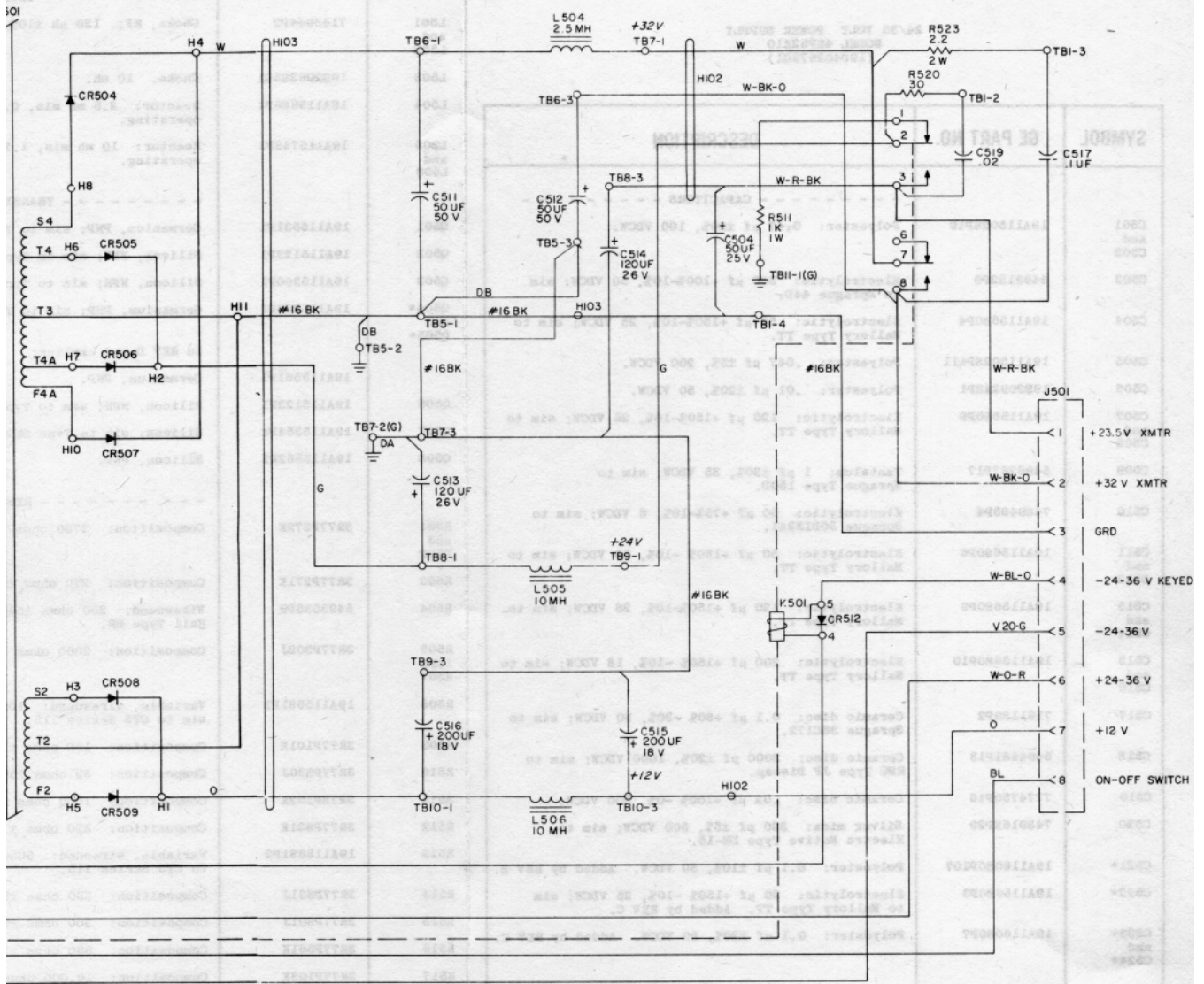
1. If Zener diode VR501 is replaced, check for 24 Volts at J501-1 with the transmitter keyed. Vary R508 if necessary to obtain this voltage.
2. If Q507 is replaced, check for a 400-microsecond duration saw-tooth waveform across C505. Adjust R513 if necessary to obtain this waveform.

3. If Q508 or Zener R522 and then R508 fuse monitoring the output voltage. If the input voltage to the input fuse blows. When the fuse has been replaced, the unit and switch the unit fully clockwise. Repeat the ON-OFF switch to ON. Check for an output voltage of 24 Volts.



(19R620761, Rev. 8)

3. If Q508 or Zener diode VR502 is replaced, adjust R522 and then R508 fully counterclockwise. While monitoring the output voltage, key the unit and increase the input voltage to 40 Volts. Adjust R522 until the input fuse blows. When the fuse blows the output voltage should have been between 27.5 and 29.5 Volts. Unkey the unit and switch the ON-OFF switch OFF. Reset R508 fully clockwise. Replace the input fuse. Switch the ON-OFF switch to ON. Key the unit and adjust R508 for an output voltage of  $23.5 \pm .15$  Volts.



v. 8)

**NOTES:**

1. ALL WIRES N22 UNLESS OTHERWISE SPECIFIED.
2. 22-W IS TEFLON WIRE 19A115463PI0.
3. PERMISSIBLE TO USE SLEEVING 4038593P5 ON BUS WIRE JUMPERS.

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS, INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO	
MODEL NO 4EP52A10	REV LETTER E

**SERVICE SHEET**

**POWER SUPPLY  
24/36 VOLT, ± GROUND  
MODEL 4EP52A10**

(RC-1364F)

**PARTS LIST**

LBI-3542E

CONTROL UNIT  
 MODEL 4EC60A10 19D402279G1 (Single Frequency)  
 MODEL 4EC60A12 19D402279G3 (Two Frequency)  
 MODEL 4EC60A16 19D402279G7 (Single Frequency)  
 MODEL 4EC60A19 19D402279G10 (Two Frequency)

SYMBOL	GE PART NO.	DESCRIPTION
		----- CAPACITORS -----
C701*	5494481P7	Ceramic disc: 470 pf $\pm 20\%$ , 1000 VDCW. Added by REV B.
C705*	5494481P14	Ceramic disc: 2000 pf $\pm 10\%$ , 1000 VDCW. Added to Models 4EC60A10, 12 by REV E. Added to Models 4EC60A16, 19 by REV D.
		----- INDICATING DEVICES -----
DS701	4034664P1	Lamp, incandescent: 28 v, .04 amp; sim to GE 2148.
		----- JACKS AND RECEPTACLES -----
J701	7473192P31	Connector: 8 terminals, phenolic; sim to HB Jones 261-31-02-000.
J702	19A116550P1	Connector, coaxial: 500 v max operating; sim to Gold Line G.C-88.
J703	19B209201P1	Connector: 4 contacts; sim to Switchcraft 3C-1088.
		----- RELAYS -----
K701*	19C307010P18	Armature: 12 VDC nominal, 130 ohms res $\pm 10\%$ , 4 form C contacts; sim to Allied Control T154-X-976A.  In Models 4EC60A10, 12 earlier than REV D: In Models 4EC60A16, 19 earlier than REV C:
	19C307010P5	Armature: 12 VDC nominal, 130 ohms $\pm 10\%$ coil res, 4 form C contacts; sim to Allied Control T154.
		----- LOUDSPEAKERS -----
LS701	19C307094P1	Permanent magnet: 3.2 ohms $\pm 10\%$ voice coil imp., 3 w input, 325 $\pm 50$ Hz resonance, paper dust cap; sim to Oaktron S7473.
		----- PLUGS -----
P701 and P702	4029840P2	Contact, electrical; sim to Amp 42827-2. (Used in Models 4EC60A12 and 4EC60A19 only).
P705	4029840P2	Contact, electrical; sim to Amp 42827-2.
P706 thru P708	4029840P1	Contact, electrical; sim to Amp 41854.
P709	4029840P2	Contact, electrical; sim to Amp 42827-2.
P710	4029840P1	Contact, electrical; sim to Amp 41854.
P712 thru P714	4029840P2	Contact, electrical; sim to Amp 42827-2.
P716 thru P718	4029840P2	Contact, electrical; sim to Amp 42827-2.
P720	4029840P2	Contact, electrical; sim to Amp 42827-2.
P722 and P723	4029840P2	Contact, electrical; sim to Amp 42827-2. (Used in Models 4EC60A12 and 4EC60A19 only).
P724 and P725	7147199P2	Connector: 1 female contact; sim to Winchester Electronics 21804.
P726	4036634P1	Receptacle, pin: sim to Amp 42428-2.
		----- TRANSISTORS -----
Q701*	19A116118P3	Silicon, NPN.  In 4EC60A10, 12 of REV A-F: In 4EC60A16, 19 of REV A-E:
	19A115527P1	Silicon, NPN.  In Models earlier than REV A:
	19A115246P1	Silicon, NPN; sim to Type 2N1701.

\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



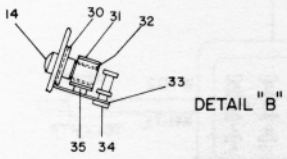
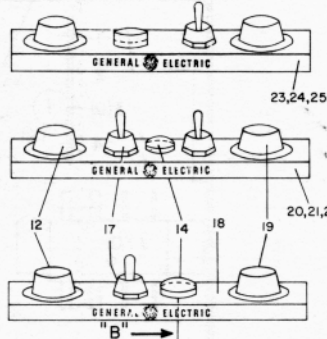
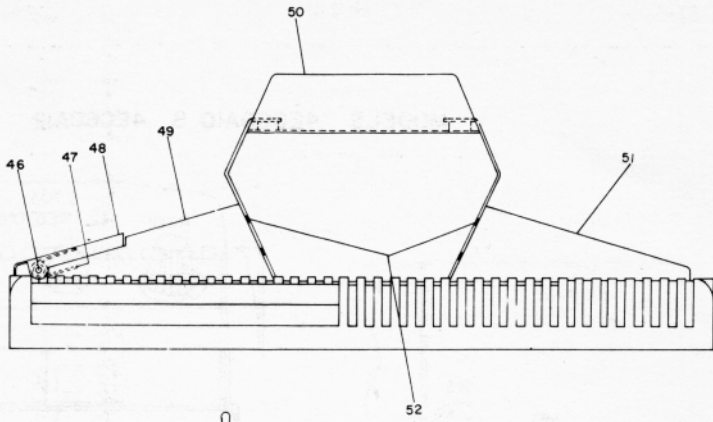
SYMBOL	GE PART NO.	DESCRIPTION
		----- RESISTORS -----
R701	19C300097P10	Resistor/switch: includes Resistor, variable, carbon film, 5000 ohms $\pm 20\%$ , 1/8 w; (S701) Switch, 2 amps at 125 VAC; sim to Mallory Type MLC.
R702	19C300097P9	Variable, carbon film: 5000 ohms $\pm 20\%$ , 1/4 w; sim to Mallory Type MLC.
R703	19B209022P115	Wirewound, phen: 1 ohm $\pm 10\%$ , 2 w; sim to IRC Type BWH.
R704*	19B209022P135	Wirewound, phen: 6.8 ohms $\pm 10\%$ , 2 w; sim to IRC Type BWH. Deleted by REV E, F.  In Models earlier than REV A:
	19B209022P38	Wirewound, phen: 9.1 ohms $\pm 5\%$ , 2 w; sim to IRC Type BWH.
R705	19B209022P131	Wirewound, phen: 4.7 ohms $\pm 10\%$ , 2 w; sim to IRC Type BWH. (Used in Models 4EC60A16 and 19).
R706	3R77P241J	Composition: 240 ohms $\pm 5\%$ , 1/2 w. (Used in Models 4EC60A16 and 4EC60A19 only).
		----- SWITCHES -----
S701		(Part of R701).
S702*	19B209040P1	Slide: DPDT, 0.5 amp at 125 v; sim to Continental Wirt 126. Deleted by REV E, F.
S703*	19A116877P6	Toggle: DPDT, 1 ma at 6 VDC; sim to C and K Components 7201G.  In 4EC60A12 of REV G and earlier: In 4EC60A19 of REV F and earlier:
	4036949P2	Toggle: DPDT, 100 $\mu$ a at 5 VDC; sim to Arrow-Hart and Hegeman TS-6. (Used in Models 4EC60A12 and 4EC60A19 only).
S705	19B209239P1	Pushbutton (red): SPDT, 250 ma at 115 VAC or 25 VDC; sim to Switchcraft 923. (Used in Models 4EC60A16 and 4EC60A19 only).
		----- TRANSFORMERS -----
T701	19B209079P1	Audio freq: freq range 0.3-3 KHz, Pri 1: 55 ohms $\pm 10\%$ imp at 1 w, 0.895 ohm $\pm 10\%$ DC res, Sec 1: 3.2 ohms $\pm 10\%$ at 1 w, 0.168 ohm max DC res.
		----- TERMINAL BOARDS -----
TB1	7775500P8	Phen: 4 terminals.
TB2	7775500P55	Phen: 5 terminals.
TB3	7775500P44	Phen: 2 terminals. (Used in Models 4EC60A10 and 4EC60A12 only).
	7775500P7	Phen: 3 terminals. (Used in Models 4EC60A16 and 4EC60A19 only).
		----- CABLES -----
W701		CABLE ASSEMBLY 19A121176G1
		----- PLUGS -----
P711	5496078P1	Connector, push-on: Teflon; sim to FRX 27-1.
		----- MISCELLANEOUS -----
	19B209044P11	Cable, RF: 5.75 inches long. Type RG-174/U.
W702		CABLE ASSEMBLY 19A121176G2
		----- PLUGS -----
P727	5496078P2	Connector, push-on: Teflon; sim to FXR 27-2.
		----- MISCELLANEOUS -----
	19B209044P13	Cable, RF: 4 inches long. Type RG-188/U.
		----- SOCKETS -----
XK701	5491595P5	Relay, nylon: 16 contacts; sim to Allied Control 30054-2.



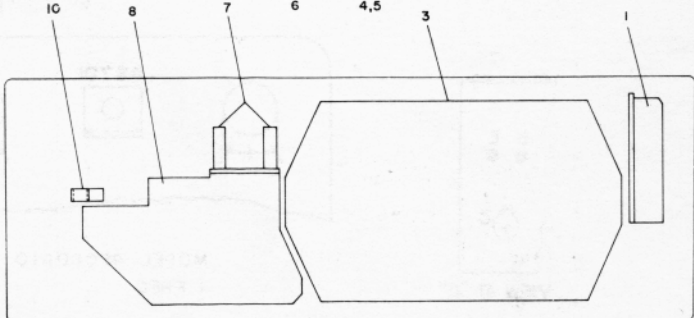
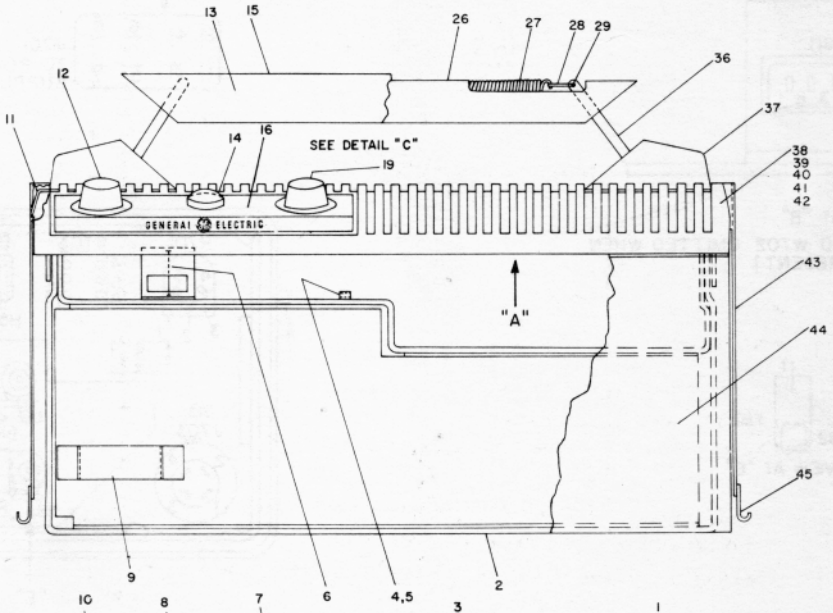
SYMBOL	GE PART NO.	DESCRIPTION
		<p>HARNESS ASSEMBLY 19D402279G25 (4EC60A10)</p> <p>(Includes C701, C705, J701, P705-P708, P710, P712-P714, P716-P718, P720, P724-P726, Q701, R701-R703, S701, TB1, TB2, W701, W702, XK701).</p> <p>HARNESS ASSEMBLY 19D402279G27 (4EC60A12) 19D402279G34 (4EC60A19)</p> <p>(Includes C701, C705, J701, P701, P702, P705-P710, P712-P714, P716-P718, P720, P722-P726, Q701, R701-R703, S701, S703, TB1, TB2, W701, W702, XK701).</p> <p>HARNESS ASSEMBLY 19D402279G31 (4EC60A16)</p> <p>(Includes C701, C705, J701, P705-P708, P710, P712-P720, P724-P726, Q701, R701-R703, S701, TB1, TB2, W701, W702, XK701).</p> <p>DC CHARGING CABLE ASSEMBLY 19B204993G1</p> <p>----- MISCELLANEOUS -----</p> <p>7160478P1 Cable: 2 conductor, 50 inches; sim to Birnbach 789.</p> <p>4034405P1 Plug, general purpose: 4 contacts, polarized, 10 amps at 133 VRMS; sim to Cannon XLR-4-11C.</p> <p>19A115513P1 Connector, cigarette lighter: 12 VDC; sim to Cole-Hersse 1624.</p> <p>ANTENNA RELAY KIT 19B216362G2</p> <p>(Includes J702 and K1)</p> <p>POWER SUPPLY EXTENSION CABLE ASSEMBLY 19B204289G1</p> <p>----- MISCELLANEOUS -----</p> <p>7473192P19 Socket, phenolic: 8 terminals, cable clamp in cap; sim to HB Jones 261-32-08-030.</p> <p>7473192P26 Plug, phenolic: 8 terminals, cable clamp in cap; sim to HB Jones 261-31-08-030.</p> <p>7162441P23 Tubing, flexible, plastic: 3 feet long.</p> <p>AUTO GUTTER MOUNT ANTENNA MODEL 4EY20A10 (High Band)</p> <p>----- MISCELLANEOUS -----</p> <p>19C303620P1 Antenna Assembly. Includes: plastic ball tip; 19.5 ±0.25 inch stainless steel whip; socket; insulators; adapter; RG-58A/U cable; PL-259 plug; clip; 2-set screws; rubber pad; sim to Antenna Specialists ASP157.</p> <p>19C303620P2 Replacement Whip Assembly. Includes: plastic ball tip; 19.5 ±0.25 inch stainless steel whip; socket; insulators; sim to Antenna Specialists 19A904-1.</p> <p>MICROPHONE MODEL 4EM33D10</p> <p>----- MISCELLANEOUS -----</p> <p>Switch: moisture proof. Shure Brothers RP33.</p> <p>Cable and Plug Assembly. Approx 5 feet. Shure Brothers RP35.</p> <p>Button, switch: red plastic. Shure Brothers RP34.</p> <p>Cartridge, transmitter: controlled magnetic. Shure Brothers RP32.</p> <p>Case, Mounting button and Nameplate: plastic. Shure Brothers RP31.</p> <p>Shield. Shure Brothers RP36.</p>

SYMBOL	GE PART NO.	DESCRIPTION
		<p>HANDSET MODEL 4EM34A10</p> <p>----- MISCELLANEOUS -----</p> <p>Cartridge, transmitter: controlled magnetic. Shure Brothers RP13.</p> <p>Cartridge, receiver: 3 w max power. Shure Brothers RP41.</p> <p>Switch: with mounting plate. Shure Brothers RP81.</p> <p>Cable and Plug Assembly. Includes: 4 conductor tinsel coiled cord, neoprene jacket, extended length approx 5 feet, molded on weather proof 4-pin plug. Shure Brothers RP47.</p> <p>Handle Assembly. phenolic, weather proof construction. Shure Brothers RP49.</p> <p>Cap, transmitter: phenolic. Shure Brothers RP49.</p> <p>Cap, receiver: phenolic. Shure Brothers RP49.</p>
		<p>PORTABLE ANTENNA MODELS 4EY18A10-15</p> <p>MODEL 4EY18A10 25-29 MHz MODEL 4EY18A11 29-33 MHz MODEL 4EY18A12 33-36 MHz MODEL 4EY18A13 36-42 MHz MODEL 4EY18A14 42-48 MHz MODEL 4EY18A15 48-54 MHz</p>
		<p>PORTABLE ANTENNA MODELS 4EY19C10-15</p> <p>MODEL 4EY19C10 130-150.8 MHz MODEL 4EY19C11 150.8-162 MHz MODEL 4EY19C12 162-166 MHz MODEL 4EY19C13 166-174 MHz MODEL 4EY19C14 406-420 MHz MODEL 4EY19C15 450-470 MHz</p>
		<p>MECHANICAL PARTS (SEE RC-1087)</p>
1	19A121154P1	Support. (Used with Q701).
2	19B204532G1	Chassis Assembly.
3	19B204527P1	Diaphragm.
4	7763541P3	Clip.
5		(Used with Channel Guard and Selective Calling only).
6	5491595P9	Spring, retainer; sim to Allied Control 30040-2. (Used with K701).
7	7142162P98	(Not Used).
8	19A121174G1	Chassis Assembly.
9	19A121178P1	Support. (Used with J701).
10	19A121199P1	Clip.
11	19A121215P1	Spring. (Used in Models 4EC60A10, 12 only).
12	19B204639G2	Knob Assembly.
13	19C303537G1	Handle Assembly: (Includes items 15, 22, 27, 28, 29 and 36). (Used in Models 4EC60A10 and 4EC60A12 only).
14	19B204949P1	Jewel: red plastic; sim to Rohm and Haas 2444.
15	19B204492P1	Extrusion. (Part of Handle Assembly, 19C303537G1)
16	NP243498	Nameplate: etched aluminum. (Used in Models 4EC60A10 and 4EC60A16 only).
17	5490135P3	Boot, dust and moisture seal: silicon rubber; sim to AMP-Hexseal N-5032-B. (Used in Models 4EC60A12 and 4EC60A19 only).
18	NP243497	Nameplate: etched aluminum. (Used in Models 4EC60A12 and 4EC60A19 only).
19	19B204639G1	Knob Assembly. (Used with R702).
20		(Used in Model 4EC60A20 only).
21		(Used in Model 4EC60A15 only).
22		(Used in Model 4EC60A21 only).

SYMBOL	GE PART NO.	DESCRIPTION
23		(Used in Model 4EC60A14 only).
24		(Used in Model 4EC60A17 only).
25		(Used in Model 4EC60A18 only).
26	19C303538P1	Handle. (Part of Handle Assembly, 19C303537G1).
27	19A121363P1	Spring. (Part of Handle Assembly, 19C303537G1).
28	19A121173P1	Retainer. (Part of Handle Assembly, 19C303537G1).
29	N533P1308	Pin, dowel. (Part of Handle Assembly, 19C303537G1).
30	4031053P7	Nut, speed; sim to Tinnerman C12046-012-67.
31	4035711P4	Clip, spring tension; sim to Augat Brothers 6007.
32	7150727P116	Sleeving, insulation: 30 inches long.
33	19A121730P1	Bracket.
34	4034512P3	Terminal, feed-thru, insulated: sim to Sealectro RST-MM-10-TUR.
35	7142162P96	Spacer.
36	19A121343G1	Support Assembly. (Part of Handle Assembly, 19C303537G1).
37	19C303427P1	Casting. (Used in Models 4EC60A10, 12 only).
38	19C303457P3	Casting. (Used in Model 4EC60A12 only).
39	19C303457P1	Casting. (Used in Model 4EC60A10 only).
40	19C303457P2	Casting. (Used in Model 4EC60A16 only).
41	19C303457P4	Casting. (Used in Model 4EC60A19 only).
42		Used in Models 4EC60A15, 20 and 21 only.
43	19A121169G1	Support Assembly.
44	19B204501G1	Case Assembly.
45	4029994P1	Strike: chrome plated steel.
46	N509P1914C	Pin, dowel. (Used in Models 4EC60A16, 19 only).
47	19A121741P1	Spring. (Used in Models 4EC60A16, 19 only).
48	19B204963P1	Lever. (Used in Models 4EC60A16, 19 only).
49	19C303679P1	Casting. (Used in Models 4EC60A16, 19 only).
50	19A127584G1	Handle Assembly. (Used in Models 4EC60A16, 19 only).
51	19C303679P2	Casting. (Used in Models 4EC60A16, 19 only).
52	N648P9004	Screw: Cap (Used for mounting handle).



DETAIL "C"



VIEW "A"

RC-1087C

## PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - To incorporate an improved output transistor. Changed Q701 and R704.

REV. B - To reduce high frequency gain of audio transistor. Added C701.

REV. C - (Models 4EC60A10 & 12 only)  
To provide audio to microphone jack. Added white-green wire between LS701-2 and J703-4.

REV. C - (Models 4EC60A16 & 19)

REV. D - (Models 4EC60A10 & 12)  
To incorporate an improved relay. Changed K701.

REV. D - (Models 4EC60A16 & 19)

REV. E - (Models 4EC60A10 & 12)  
To eliminate instability of the receiver PA caused by the use of a higher gain PA transistor. Added C705 from the emitter of Q701 to the chassis.

REV. E - (Models 4EC60A16 & 19)

REF. F - (Models 4EC60A10 & 12)  
To eliminate Audio LO Switch and associated resistor.  
Deleted S702 and R704.

REV. F - (Models 4EC60A16 & 19)

REV. G - (Models 4EC60A10 & 12)  
To incorporate a new transistor  
Changed Q701.

REV. G - (Model 4EC60A19)

REV. H - (Model 4EC60A12)  
To incorporate new switch  
Changed S703.



**PARTS LIST**

LBI-3727D

MODEL 4EC60A22 CONTROL UNIT  
 MODEL 4EC60A24 19D402279G13 (Single Frequency)  
 19D402279G15 (Two Frequency)

SYMBOL	GE PART NO.	DESCRIPTION
----- CAPACITORS -----		
C701	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW.
C705*	5494481P14	Ceramic disc: 2000 pf ±10%, 1000 VDCW. Added by REV C.
----- INDICATING DEVICES -----		
DS701	4034664P1	Lamp, incandescent: 28 v, .04 amp; sim to GE 2148.
----- JACKS AND RECEPTACLES -----		
J701	7473192P31	Connector: 8 terminals, phenolic; sim to HB Jones 261-31-02-000.
J702	19A116550P1	Connector, coaxial: sim to Gold Line GLC-88.
J703	19B209201P1	Connector: 4 contacts; sim to Switchcraft 3C-1088.
J704	7489183P5	Connector: 9 contacts (Accessory Jack Option).
----- RELAYS -----		
K701*	19C307010P18	Armature: 12 VDC nominal, 130 ohms res ±10%, 4 form C contacts; sim to Allied Control T154-X-976A.  In Models earlier than REV B:
	19C307010P5	Armature: 12 VDC nominal, 130 ohms ±10% coil res, 1.5 w max operating, 4 form C contacts; sim to Allied Control T154-X-413.
----- LOUDSPEAKERS -----		
LS701	19C307094P1	Permanent magnet: 3.2 ohms ±10% voice coil imp., 3 w input, 325 ±50 Hz resonance, paper dust cap; sim to Oaktron S7473.
----- PLUGS -----		
P701 and P702	4029840P2	Contact, electrical; sim to Amp 42827-2.
P705	4029840P2	Contact, electrical; sim to Amp 42827-2.
P706 thru P708	4029840P1	Contact, electrical; sim to Amp 41854.
P709	4029840P2	Contact, electrical: sim to Amp 42827-2.
P710	4029840P1	Contact, electrical: sim to Amp 41854.
P712 thru P714	4029840P2	Contact, electrical: sim to Amp 42827-2.
P716 thru P718	4029840P2	Contact, electrical; sim to Amp 42827-2.
P720	4029840P2	Contact, electrical; sim to Amp 42827-2.
P722 and P723	4029840P2	Contact, electrical; sim to Amp 42827-2.
P724 and P725	7147199P2	Connector: 1 female contact; sim to Winchester Electronics 21804.
P726	4036634P1	Receptacle, pin: sim to Amp 42428-2.
----- TRANSISTORS -----		
Q701*	19A116118P3	Silicon, NPN.  In REV D and earlier:
	19A115527P1	Silicon, NPN.
----- RESISTORS -----		
R701	19C300097P10	Resistor/switch: includes Resistor, variable, carbon film, 5000 ohms ±20%, 1/8 w; (S701) Switch, 2 amps at 125 VAC; sim to Mallory Type MLC.

\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
R702	19C300097P9	Variable, carbon film: 5000 ohms $\pm 20\%$ , 1/4 w; sim to Mallory Type MLC.
R703	19B209022P115	Wirewound, phen: 1 ohm $\pm 10\%$ , 2 w; sim to IRC Type BWH.
R704*	19B209022P135	Wirewound, phen: 6.8 ohms $\pm 10\%$ , 2 w; sim to IRC Type BWH. Deleted by REV D.
----- SWITCHES -----		
S701		(Part of R701).
S702*	19B209040P1	Slide: DPDT, 0.5 amp at 125 v; sim to Continental Wirt 126. Deleted by REV D.
S703*	19A116877P6	Toggle: DPDT, 1 ma at 6 VDC; sim to C and K Components Series Type 7201G.
	4036949P2	In 4EC60A24 of REV E and earlier: Toggle: DPDT, 100 $\mu$ a at 5 VDC; sim to Arrow-Hart and Hegeman TS-6.
----- TRANSFORMERS -----		
T701	19B209079P1	Audio frequency: freq range 0.3-3 KHz, Pri 1: 55 ohms $\pm 10\%$ imp at 1 w, 0.895 ohm $\pm 10\%$ DC res, Sec 1: 3.2 ohms $\pm 10\%$ at 1 w, 0.168 ohm max DC res.
----- TERMINAL BOARDS -----		
TB1	7775500P8	Phen: 4 terminals.
TB3	7775500P44	Phen: 2 terminals.
TB4	7775500P11	Phen: 5 terminals.
----- CABLES -----		
W701		CABLE ASSEMBLY 19A121176G1
----- PLUGS -----		
P711	5496078P1	Connector, push-on: Teflon; sim to FRX 27-1.
----- MISCELLANEOUS -----		
W702	19B209044P11	Cable, RF: approx 5 inch long. Type RG/U174.
		CABLE ASSEMBLY 19A121176G2
----- PLUGS -----		
P727	5496078P2	Connector, push-on: Teflon; sim to FXR 27-2.
----- MISCELLANEOUS -----		
	19B209044P13	Cable, RF: 4 inches long. Type RG/U188.
----- SOCKETS -----		
XK701	5491595P5	Relay, nylon: 16 contacts; sim to Allied Control 30054-2.
		HARNES ASSEMBLY 19D402279G37 1 FREQ. (Includes C701, C705, J701, P705-P708, P710, P712-P714, P716-P718, P720, P724-P726, R701-R703, TB1, TB3, TB4, W701, W702, XK701).
		HARNES ASSEMBLY 19D402279G39 2 FREQ. (Includes C701, C705, J701, P701, P702, P705-P710, P712-P714, P716-P718, P720, P722-P726, R701-R703, S703, TB1, TB3, TB4, W701, W702, XK701).
		DC CHARGING CABLE ASSEMBLY 19B204993G1
----- MISCELLANEOUS -----		
	7160478P1	Cable: 2 conductor, 50 inches; sim to Birnbach 789.

SYMBOL	GE PART NO.	DESCRIPTION
	4034405P1	Plug, general purpose: 4 contacts, polarized, 10 amps at 133 VRMS; sim to Cannon XLR-4-11C.
	19A115513P1	Connector, cigarette lighter: 12 VDC; sim to Cole-Hersse 1624.
		<p style="text-align: center;">ANTENNA RELAY KIT 19B216362G2 (Includes J702 and K1)</p> <p style="text-align: center;">POWER SUPPLY EXTENSION CABLE ASSEMBLY 19B204289G1</p> <p style="text-align: center;">----- MISCELLANEOUS -----</p>
	7473192P19	Socket, phenolic: 8 terminals, cable clamp in cap; sim to HB Jones 261-32-08-030.
	7473192P26	Plug, phenolic: 8 terminals, cable clamp in cap; sim to HB Jones 261-31-08-030.
	7162441P23	Tubing, flexible, plastic: 3 feet long.
		<p style="text-align: center;">AUTO GUTTER MOUNT ANTENNA MODEL 4EY20A10 (High Band)</p> <p style="text-align: center;">----- MISCELLANEOUS -----</p>
	19C303620P1	Antenna Assembly. Includes: plastic ball tip; 19.5 ±0.25 inch stainless steel whip; socket; insulators; adapter; RG-58A/U cable; PL-259 plug; clip; 2-set screws; rubber pad; sim to Antenna Specialists ASP157.
	19C303620P2	Replacement Whip Assembly. Includes: plastic ball tip; 19.5 ±0.25 inch stainless steel whip; socket; insulators; sim to Antenna Specialists 19A904-1.
		<p style="text-align: center;">MICROPHONE MODEL 4EM33D10</p> <p style="text-align: center;">----- MISCELLANEOUS -----</p>
		Switch: moisture proof. Shure Brothers RP33.
		Cable and Plug Assembly. Approx 5 feet. Shure Brothers RP35.
		Button, switch: red plastic. Shure Brothers RP34.
		Cartridge, transmitter: controlled magnetic. Shure Brothers RP32.
		Case, Mounting button and Nameplate: plastic. Shure Brothers RP31.
		Shield. Shure Brothers RP36.
		<p style="text-align: center;">HANDSET MODEL 4EM33C10</p> <p style="text-align: center;">----- MISCELLANEOUS -----</p>
		Switch. Shure Brothers RP33.
		Cable and plug: approx 5 feet. Shure Brothers RP35.
		Button: red plastic. Shure Brothers RP34.
		Cartridge, magnetic controlled. Shure Brothers RP32.
		Case, mounting button and nameplate: plastic. Shure Brothers RP94.
		Shield. Shure Brothers RP36.
		<p style="text-align: center;">PORTABLE ANTENNA</p> <p>MODEL 4EY18A10 25-29 MHz MODEL 4EY18A11 29-33 MHz MODEL 4EY18A12 33-36 MHz MODEL 4EY18A13 36-42 MHz MODEL 4EY18A14 42-48 MHz MODEL 4EY18A15 48-54 MHz</p> <p style="text-align: center;">PORTABLE ANTENNA</p> <p>MODEL 4EY19C10 130-150.8 MHz MODEL 4EY19C11 150.8-162 MHz MODEL 4EY19C12 162-166 MHz MODEL 4EY19C13 166-174 MHz MODEL 4EY19C14 406-420 MHz MODEL 4EY19C15 450-470 MHz</p>

SYMBOL	GE PART NO.	DESCRIPTION
		MECHANICAL PARTS (SEE RC-1397)
1	19B204532G1	Chassis Assembly.
2	19B204527P1	Diaphragm.
3	7763541P3	Clip.
4		(Used with Channel Guard and Selective Calling only).
5	5491595P9	Spring, retainer; sim to Allied Control 30040-2. (Used with K701).
6	7142162P98	(Not Used).
7	19B205490P1	Heat sink. (Used with Q701).
8	19A121174G2	Chassis Assembly.
9	19A121178P1	Support. (Used with J701).
10	19A121199P1	(Not Used).
11	19A121215P1	Spring.
12	19B204639G2	Knob Assembly.
13	19C303537G1	Handle Assembly. (Includes items 15, 22, 23, 24, 25 and 32).
14	19B204949P1	Jewel: red plastic; sim to Rohm and Haas 2444.
15	19B204492P1	Extrusion. (Part of Handle Assembly, 19C303537-G1).
16	NP243498	Nameplate; etched aluminum. (Used in Model 4EC60A22 only).
17	5490135P3	Boot, dust and moisture seal: silicon rubber; sim to APM-Hexseal N-5032-B. (Used in Model 4EC60A24 only).
18	NP243497	Nameplate; etched aluminum. (Used in Model 4EC60A24 only).
19	19B204639G1	Knob Assembly. (Used with R702).
20		(Used in Model 4EC60A27 only).
21		(Used in Model 4EC60A26 only).
22	19C303538P1	Handle. (Part of Handle assembly, 19C303537G1).
23	19A121363P1	Spring. (Part of Handle assembly, 19C303537G1).
24	19A121173P1	Retainer. (Part of Handle assembly, 19C303537G1).
25	N533P1308	Pin, dowel. (Part of Handle assembly, 19C303537G1).
26	4031053P7	Nut, speed; sim to Tinnerman C120046012-67.
27	4035711P4	Clip, spring tension; sim to Augat Brothers 6007-8-CT.
28	7150727P116	Sleeving, insulation: 30 inches long, 0.198 inch inside diameter.
29	19A121730P1	Bracket.
30	4034512P3	Terminal, feed-thru, insulated; sim to Sealectro RST-MM-10-TUR.
31	7142162P96	Spacer.
32	19A122608G1	Support Assembly. (Part of Handle assembly, 19C303537G1).
33	19C303427P1	Casting.
34	19C303457P7	Casting. (Used in Model 4EC60A22 only).
35	19C303457P9	Casting. (Used in Model 4EC60A24 only).
36		(Used in Model 4EC60A23 only).
37		(Used in Models 4EC60A25, 26 only).
38		(Used in Model 4EC60A27 only).
39	19A121169G1	Support Assembly.
40	19B204501G1	Case Assembly.
41	4029994P1	Strike: chrome plated steel.

## PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

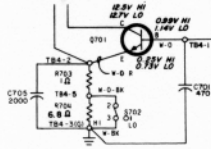
REV. A - To provide audio to microphone jack. Added white-green wire between LS701-2 and J703-4.

REV. B - To incorporate an improved relay. Changed K701.

REV. C - To eliminate instability of the receiver PA caused by the use of a higher gain PA transistor. Added C705 from the emitter of Q701 to the chassis.

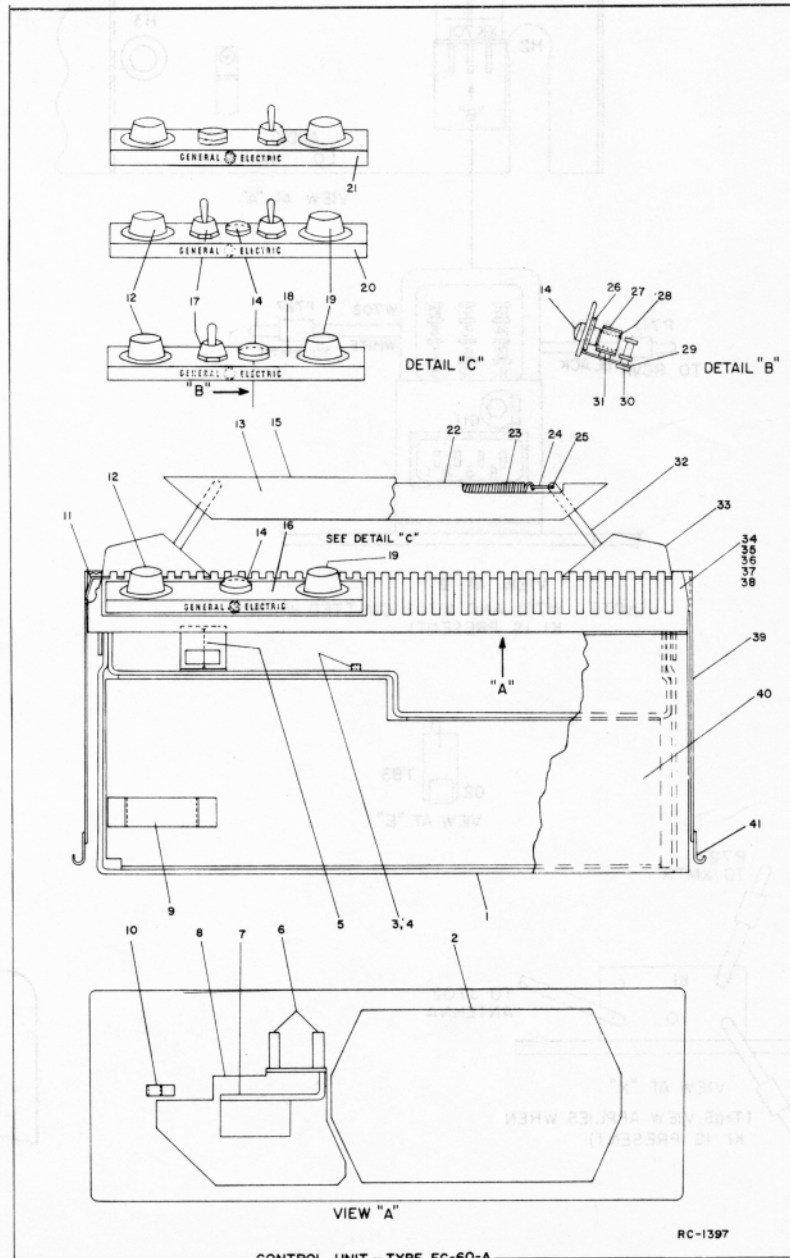
REV. D - To eliminate Audio Lo Switch. Deleted S702 and R704.

Schematic Diagram was:



REV. E - To incorporate new transistor. Changed Q701.

REV. F - Model 4EC60A24  
To improve reliability of switch.  
Changed S703.



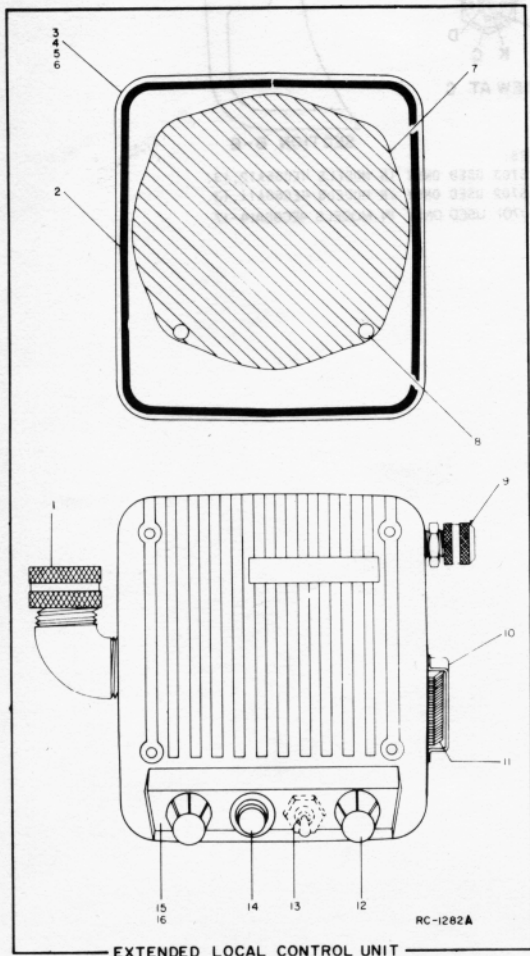


**PARTS LIST**

LBI-3668E

CONTROL UNIT  
 MODEL 4EC66A10 (19D402603G1) (1 Frequency)  
 MODEL 4EC66A11 (19D402603G2) (2 Frequency)  
 MODEL 4EC66A14 (19D402603G5) (1 Frequency with ACCESSORY JACK OPTION)  
 MODEL 4EC66A15 (19D402603G6) (2 Frequency with ACCESSORY JACK OPTION)  
 TRANSMITTER-RECEIVER TOP PANEL 19D402599G1  
 AND  
 ASSOCIATED ASSEMBLIES

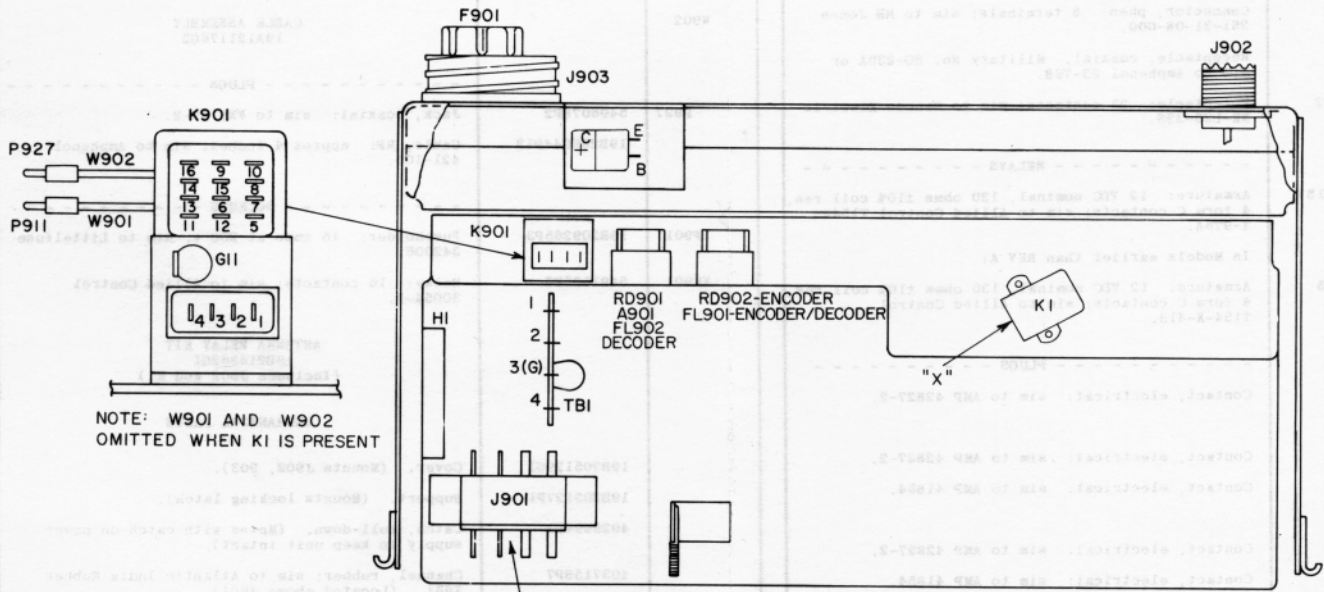
SYMBOL	GE PART NO.	DESCRIPTION
		----- INDICATING DEVICES -----
DS701	19C307037P4	Lamp, incandescent: 14 v; sim to GE 1815.
		----- JACKS AND RECEPTACLES -----
J701	7489183P5	Connector: 9 contacts; sim to Winchester M9S-LRN. (Used in Models 4EC66A14, 15).
		----- LOUDSPEAKERS -----
LS701	5491260P7	Permanent magnet, 5-inch: 3.2 ohms $\pm 10\%$ voice coil imp, 15 w max operating, 385 Hz $\pm 15\%$ resonance, paper dust cap; sim to Jensen Model P5-VA.
		----- RESISTORS -----
R701	19B209256P2	Resistor/switch: includes Resistor, variable, 5000 ohms $\pm 20\%$ , 0.25 w; Switch (S701), rotary, SPST, 7.5 amps at 20 v; sim to CTS Series 45.
R702	19B209256P1	Variable, carbon film: 5000 ohms $\pm 20\%$ , 0.5 w; sim to CTS Series 45.
		----- SWITCHES -----
S701		(Part of R701).
S702	5491899P6	Toggle: DPDT, 3 amps at 250 v; sim to Cutler-Hammer 8363K7. (Used in Model 4EC66A11).
		----- TERMINAL BOARDS -----
TB701	19B205152G1	Terminal board: 25 contacts.
		----- SOCKETS -----
XDS701	7141855P15	Lampholder: sim to Dialight Co. 95-0410-09-102.
		MECHANICAL PARTS (SEE RC-1282)
1	19A122065P1	Bushing; sim to Pyle-National DB-1191690.
2	4032574P2	Gasket, cover, neoprene.
3	19D402601P1	Casting. (Used in Model 4EC66A10).
4	19D402601P2	Casting. (Used in Model 4EC66A11).
5	19D402601P5	Casting. (Used in Model 4EC66A14).
6	19D402601P6	Casting. (Used in Model 4EC66A15).
7	19B205162P1	Diaphragm: approx 2-3/8 inches dia.
8	19A121990P1	Spacer. (Used with TB701).
9	19A122066P1	Bushing; sim to Pyle-National DB-44516.
10	4031457P1	Support. (Used with microphone).
11	4031458P1	Spring. (Used with microphone).
12	4039182G1	Knob. (Used with R701, 702).
13	5490135P4	Boot; sim to APM-Hexseal N-1030-B. (Used with S702 in Model 4EC66A11).
14	19A115040P9	Lens, panel light: red lens; sim to Dialight Type 81. (Used with DS701).
15	NP248843	Nameplate. (Used in Model 4EC66A11, 15).
16	NP248844	Nameplate. (Used in Model 4EC66A10, 14).
		TRANSMITTER-RECEIVER TOP PANEL 19D402599G1
		----- CAPACITORS -----
C901	7489162P39	Silver mica: 330 pf $\pm 5\%$ , 500 VDCW; sim to Electro Motive Type DM-15.



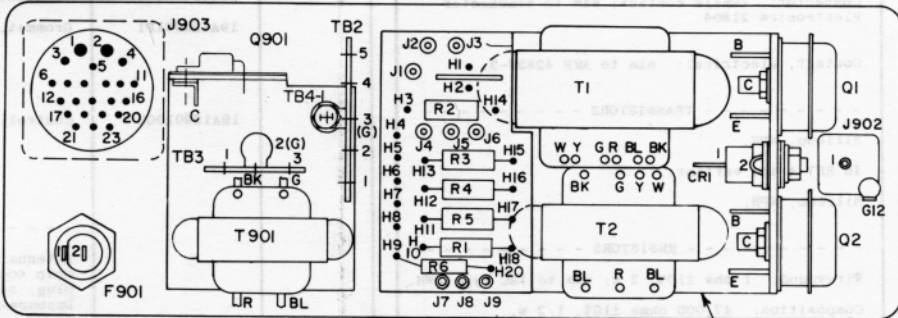
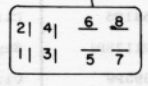
\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
C902	5494481P7	Ceramic disc: 470 pf $\pm 20\%$ , 1000 VDCW; sim to RMC Type JF Discap.
----- FUSES -----		
F901	7102673P2	Quick blowing: 15 amps at 32 v; sim to Littelfuse 311015 or Bussman AGC-15.
----- JACKS AND RECEPTACLES -----		
J901	7473192P31	Connector, phen: 8 terminals; sim to HB Jones 261-31-08-000.
J902	4029493P1	Receptacle, coaxial. Military No. SO-239A or sim to Amphenol 83-798.
J903	19B200010P2	Receptacle: 23 contacts; sim to Cannon Electric NK-L23-32S.
----- RELAYS -----		
K901*	19C307010P18	Armature: 12 VDC nominal, 130 ohms $\pm 10\%$ coil res, 4 form C contacts; sim to Allied Control T154-X-976A.  In Models earlier than REV A:
	19C307010P5	Armature: 12 VDC nominal, 130 ohms $\pm 10\%$ coil res, 4 form C contacts; sim to Allied Control T154-X-413.
----- PLUGS -----		
P901 and P902	4029840P2	Contact, electrical: sim to AMP 42827-2.
P905	4029840P2	Contact, electrical: sim to AMP 42827-2.
P906 thru P908	4029840P1	Contact, electrical: sim to AMP 41854.
P909	4029840P2	Contact, electrical: sim to AMP 42827-2.
P910	4029840P1	Contact, electrical: sim to AMP 41854.
P912 thru P914	4029840P2	Contact, electrical: sim to AMP 42827-2.
P916 thru P918	4029840P2	Contact, electrical: sim to AMP 42827-2.
P920	4029840P2	Contact, electrical: sim to AMP 42827-2.
P922 and P923	4029840P2	Contact, electrical: sim to AMP 42827-2.
P924 and P925	7147199P2	Connector: female contact; sim to Winchester Electronics 21804.
P926	4029840P2	Contact, electrical: sim to AMP 42827-2.
----- TRANSISTORS -----		
Q901*	19A116118P3	Silicon, NPN.  In REV A and earlier:
	19A115527P1	Silicon, NPN.
----- RESISTORS -----		
R901	19B209022P115	Wirewound: 1 ohm $\pm 10\%$ , 2 w; sim to IRC Type BWH.
R902	3R77P473K	Composition: 47,000 ohms $\pm 10\%$ , 1/2 w.
----- TRANSFORMERS -----		
T901	19B209079P1	Audio freq: 0.3-3 KHZ freq range, Pri: 55 ohms $\pm 10\%$ imp, 0.895 ohm $\pm 10\%$ DC res, Sec: 3.2 ohms imp, 0.168 ohm DC res.
----- TERMINAL BOARDS -----		
TB1	7775500P8	Phen: 4 terminals.
TB2	7775500P11	Phen: 5 terminals.
TB3	7775500P7	Phen: 3 terminals.

SYMBOL	GE PART NO.	DESCRIPTION
W901		----- CABLES ----- CABLE ASSEMBLY 19A121176G1
P911	5496078P1 19B209044P11	----- PLUGS ----- Push-on, coaxial: sim to FXR 27-1. Cable, RF: approx 6 inches; sim to Amphenol 21-598.
W902		CABLE ASSEMBLY 19A121176G2
P927	5496078P2 19B209044P13	----- PLUGS ----- Jack, coaxial: sim to FXR 27-2. Cable, RF: approx 4 inches; sim to Amphenol 421-105.
XF901	19B209265P3	----- SOCKETS ----- Fuseholder: 15 amps at 250 v; sim to Littelfuse 342006.
XK901	5491595P5	Relay: 16 contacts; sim to Allied Control 30054-2.
		ANTENNA RELAY KIT 19B216362G1 (Includes J902 and K1)
		MECHANICAL PARTS
	19B205129G1	Cover. (Mounts J902, 903).
	19B205127P1	Support. (Mounts locking latch).
	4029994P1	Catch, pull-down. (Mates with catch on power supply to keep unit intact).
	4037158P7	Channel, rubber; sim to Atlantic India Rubber X661. (Located above J901).
	4032574P2	Gasket, cover, neoprene.
	19A121981G1	Chassis. (Mounts T901, TB2, 3).
	7763541P5	Clip, cable. (Located between F901 and J903).
	19A121178P1	Support. (Used with J901).
	5491595P9	Clip, relay: sim to Allied Control 30040-2. (Used with K901).
	7763541P3	Clip, cable. (Located by XK901).
	19B204532G1	Chassis.
	19A122071P1	Grommet. (Located by K901).
		ASSOCIATED ASSEMBLIES
	19A122010G2	Control Mounting Kit.
		132-470 MHZ ANTENNA MODEL 4EY12A13
		----- MISCELLANEOUS -----
		Antenna: includes 20-inch stainless steel whip, whip socket, antenna cable, cable adapter, PL-259 plug; sim to Antenna Specialists ASPD201GE or Danbury-Knudsen Type PA-25.
	5490969P4	Whip: 20-inch stainless steel.
	5490969P5	Socket, whip.
	5490969P6	Whip and whip socket: 20-inch stainless steel whip, whip socket.
		Cable, antenna: approx 15 feet. Type RG-58/U. (Used with GE Dwg 2R22P1 and GE Dwg 7105381P1).
	7105381P1	Adapter, cable: 1 x 7/16 inches dia. Type UG-175/U. (Used with GE Dwg 2R22P1 and Type RG-58/U cable).
	2R22P1	Plug, coaxial: Signal Corps PL-259; sim to Amphenol 83-1SP. (Used with GE Dwg 7105381P1 and Type RG-58/U cable).

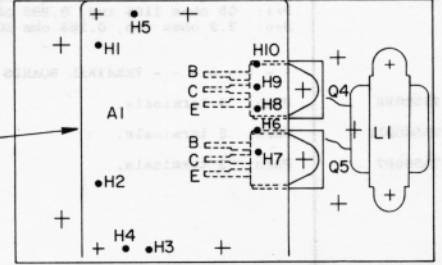
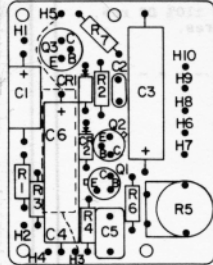


SIDE VIEW-TOP PANEL



COMPONENT VIEW-TOP COVER PANEL

10-WATT AUDIO AMPLIFIER (USED WITH 6/12V POWER)



10-WATT AUDIO AMPLIFIER (USED WITH 24/36 V POWER)

**SERVICE SHEET**

EXTENDED LOCAL CONTROL UNIT  
 MODELS 4EC66A10, 11, 14 & 15  
 AND TRANSMITTER-RECEIVER TOP PANEL  
 PL-19D402599-G1 (Used with 6/12 Volt  
 Power Supply)

P911  
 TO RCVR

VIEW AT J

DESCRIPTION OF PART NO. SYMBOL

REVISIONS

DATE

BY

CHKD

APPROVED

REVISIONS

DATE

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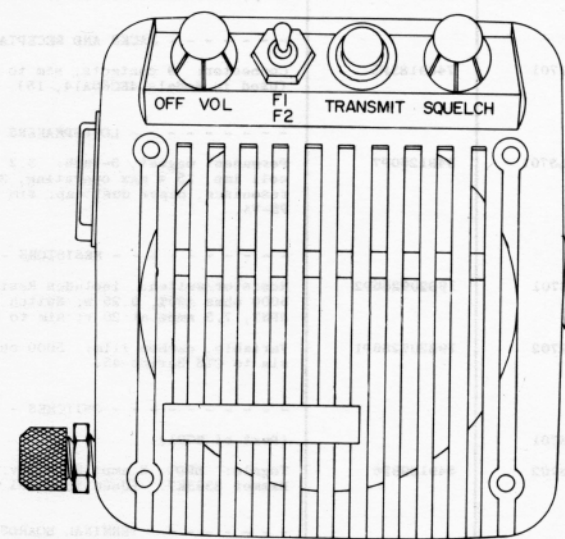
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REVISIONS

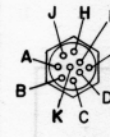
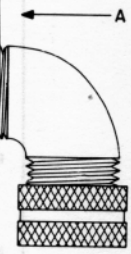
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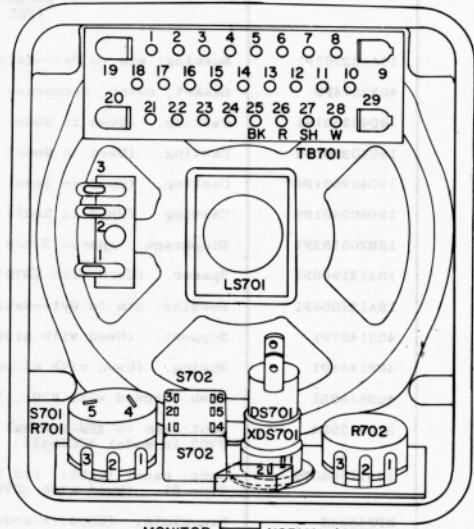
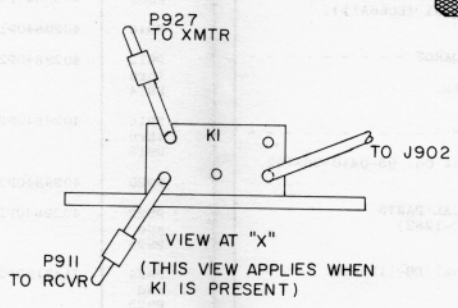
CHKD



FRONT VIEW



VIEW AT C

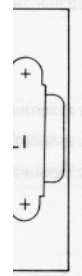


BACK VIEW

EXTENDED LOCAL CONTROL UNIT

- NOTES:
1. S703 USED
  2. S702 USED
  3. J701 USED

(12V POWER SUPPLY)

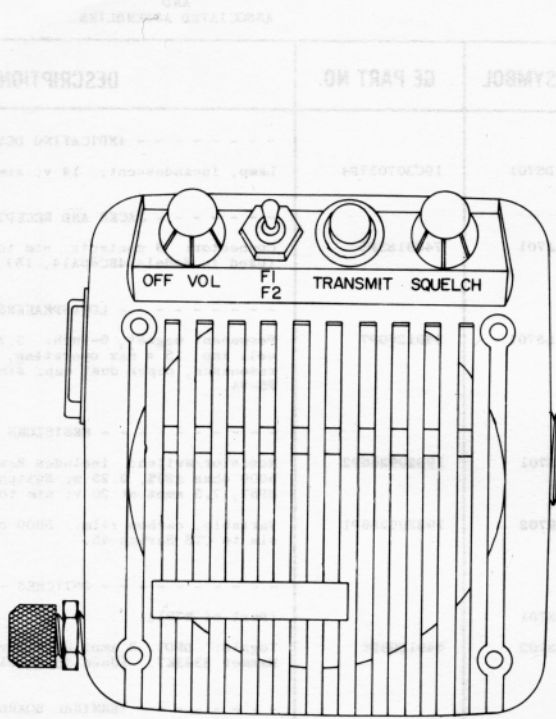


6 V POWER SUPPLY)

(19D413760, Rev. 3)

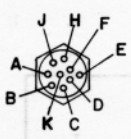
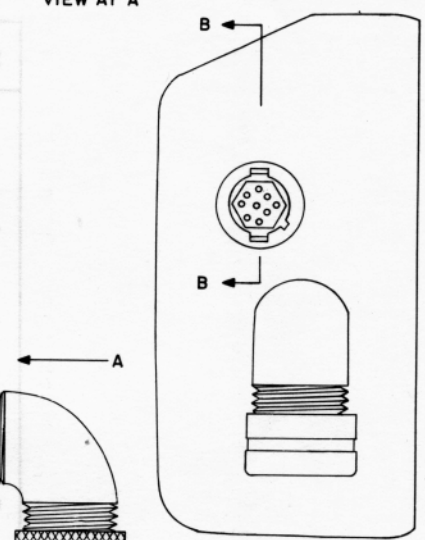


PL19B205165  
 PL19D402599

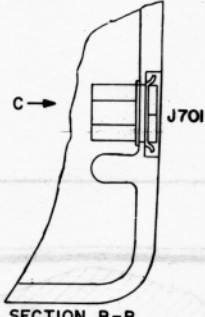


FRONT VIEW

VIEW AT A



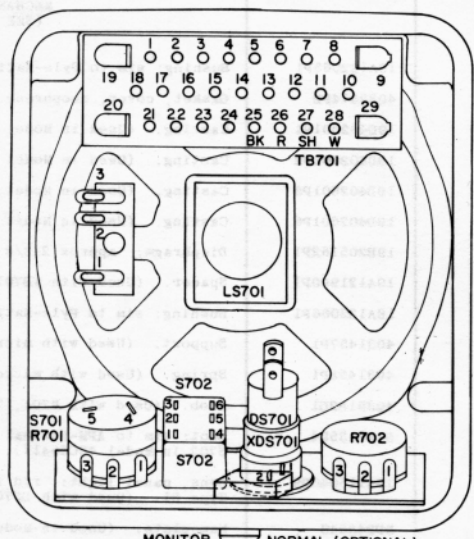
VIEW AT C



SECTION B-B

- NOTES:
1. S703 USED ONLY IN MODELS 4EC66A12, 13.
  2. S702 USED ONLY IN MODELS 4EC66A11, 13.
  3. J701 USED ONLY IN MODELS 4EC66A14-17.

902



MONITOR NORMAL (OPTIONAL)  
 S703

BACK VIEW

EXTENDED LOCAL CONTROL UNIT

SYMBOL	GE PART NO.	DESCRIPTION
		25-54 MHz ANTENNAS MODELS 4EY18A10-15 (LOW BAND)
		----- MISCELLANEOUS -----
	19C303707P1	Model 4EY18A10, 25-29 MHz Antenna. Includes 48-1/4 inch stainless steel rod, tuning screw, rubber O-ring weather seal; sim to Antenna Specialists ASP-431-GE.
	19C303707P2	Model 4EY18A11, 29-33 MHz Antenna. Includes 48-1/4 inch stainless steel rod, tuning screw, rubber O-ring weather seal; sim to Antenna Specialists ASP-A431-GE.
	19C303707P3	Model 4EY18A12, 33-36 MHz Antenna. Includes 48-1/4 inch stainless steel rod, tuning screw, rubber O-ring weather seal; sim to Antenna Specialists ASP-B431-GE.
	19C303707P4	Model 4EY18A13, 36-42 MHz Antenna. Includes 38-inch stainless steel rod, tuning screw, rubber O-ring weather seal; sim to Antenna Specialists ASP-C431-GE.
	19C303707P5	Model 4EY18A14, 42-48 MHz Antenna. Includes 38-inch stainless steel rod, tuning screw, rubber O-ring weather seal; sim to Antenna Specialists ASP-D431-GE.
	19C303707P6	Model 4EY18A15, 48-54 MHz Antenna. Includes 38-inch stainless steel rod, tuning screw, rubber O-ring weather seal; sim to Antenna Specialists ASP-E431-GE.
	2R22P2	Adapter, UHF: right angle. Signal Corps M-359; sim to Amphenol 83-1AP. (Used in Models 4EY18A10-15).
		25-50 MHz ANTENNA (LOW BAND)
		----- MISCELLANEOUS -----
	7491074P1	Antenna: includes 96-1/2 inch stainless steel rod; sim to Antenna Specialists ASPA3BGE.
	7102930P3	Adapter, antenna: 2-5/16 inches. (Used with GE Dwg 7491074P1).
	4033101G1	Antenna package: includes base, adapter spring, cable and plug.
	7472880G5	Antenna base. (Used in 4033101G1).
	7476632G4	Adapter spring. (Used in 4033101G1).
	5492239P1	Cable, antenna: includes Type RG-58/U cable approx 15 feet, PL-259 plug, terminal; sim to Antenna Specialists 15A43. (Used in 4033101G1).
	2R22P1	Plug, coaxial: Signal Corps PL-259; sim to Amphenol 83-1SP. (Used with GE Dwg 5492239P1 in 4033101G1).
	4KY9A1	Coil, loading: 25-33 MHz; sim to Antenna Specialists ASPA87.
	19A121577G1	Antenna hook kit.
	7134724P1	Antenna hook. (Used in 19A121577G1).
		PORTABLE ANTENNA MODELS 4EY19C10-15
		MODEL 4EY19C10 130-150.8 MHz MODEL 4EY19C11 150.8-162 MHz MODEL 4EY19C12 162-166 MHz MODEL 4EY19C13 166-174 MHz MODEL 4EY19C14 406-420 MHz MODEL 4EY19C15 450-470 MHz
		132-174 MHz ANTENNA MODEL 4EY20A10
		----- MISCELLANEOUS -----
	19C303620P1	Antenna. Includes 19-1/2 inch stainless steel whip, socket, insulators, adapter, RG-58A/U cable, PL-259 plug, clip; sim to Antenna Specialists ASP-157.
	19C303620P2	Replacement whip. Includes 19-1/2 inch stainless steel whip, socket, insulators; sim to Antenna Specialists 19A904-1.

SYMBOL	GE PART NO.	DESCRIPTION
		MICROPHONE MODEL 4EM25C10
1		Cable clamp. Shure Brothers RP21. (Includes parts 3 and 8).
2		Switch. Shure Brothers RP26.
3		Case (back) and mounting button: plastic. Shure Brothers RP21. (Includes parts 1 and 8).
4		Switch button: red plastic. Shure Brothers RP25.
5		Spring. Shure Brothers RP16. (Includes miscellaneous hardware).
6		Shield. Shure Brothers RP23.
7		Cartridge, magnetic controlled.
8		Case (front): plastic. Shure Brothers RP21. (Includes parts 1 and 3).
9		Cable: approx 6 feet.
		MICROPHONE MODEL 4EM33C10
		- - - - - MISCELLANEOUS - - - - -
		Switch. Shure Brothers RP33.
		Cable and plug: approx 80 inches. Shure Brothers RP35.
		Button: red plastic. Shure Brothers RP34.
		Cartridge, magnetic controlled. Shure Brothers RP32.
		Case, mounting button and nameplate: plastic. Shure Brothers RP94.
		Shield. Shure Brothers RP36.
		MICROPHONE MODEL 4EM33D10
		- - - - - MISCELLANEOUS - - - - -
		Switch: moisture proof. Shure Brothers RP33.
		Cable and plug: approx 80 inches. Shure Brothers RP35.
		Button: red plastic. Shure Brothers RP34.
		Cartridge, magnetic controlled. Shure Brothers RP32.
		Case, mounting button and nameplate: plastic. Shure Brothers RP31.
		Shield. Shure Brothers RP36.
		HANDSET MODEL 4EM34A10
		- - - - - MISCELLANEOUS - - - - -
		Cartridge, transmitter: controlled magnetic. Shure Brothers RP13.
		Cartridge, receiver: 3 watt max power. Shure Brothers RP-41.
		Switch. Shure Brothers RP81.
		Cable and plug: approx 5 feet. Shure Brothers RP47.
		Handle, transmitter cap, receiver cap: phen, weather proof. Shure Brothers RP49.
		POWER CONTROL CABLE 19C320416G1
	19A116855P1	Cable assembly: approx 10 feet long.
	4029840P2	Contact, electrical: sim to Amp 42827-2. (Quantity 13).
	4029840P1	Contact, electrical: sim to AMP 41854. (Quantity 3).
	402984P2	Contact, electrical: sim to AMP 41274. (Quantity 4).
	19B209260P18	Solderless terminal: sim to AMP 41125. (Supplied unassembled with cable).

SYMBOL	GE PART NO.	DESCRIPTION
	19B209260P27	Solderless terminal: sim to AMP 31828-LOOSE PC. (Supplied unassembled with cable).
	19B209260P101	Solderless terminal: sim to AMP 60456-1. (Cable ground terminal).
		POWER CONTROL CABLE 19C303828G4
		----- MISCELLANEOUS -----
	7139880P12	Cable, 17 conductor: approx 10 feet.
	19A129177P1	Plug: 23 contacts.
	4029840P1	Contact, electrical: sim to AMP 41854. (Quantity 3).
	4029840P2	Contact, electrical: sim to Amp 42827-2. (Quantity 13).
	4029484P2	Contact, electrical. (Quantity 4).
	19B209260P101	Solderless terminal: sim to AMP 60456-1. (Used with cable shield).
	7117269P1	Solderless terminal. (Quantity 2).
		POWER CONTROL CABLE 19C303828G6
		----- MISCELLANEOUS -----
	7139880P10	Cable, 17 conductor: approx 20 feet.
	19A129177P1	Plug: 23 contacts.
	4029840P1	Contact, electrical: sim to AMP 41854. (Quantity 3).
	4029840P2	Contact, electrical: sim to Amp 42827-2. (Quantity 13).
	4029484P2	Contact, electrical. (Quantity 4).
	19B209260P101	Solderless terminal: sim to AMP 60456-1. (Used with cable shield).
	19B209260P27	Solderless terminal: sim to AMP 31828-LOOSE PC. (Quantity 2).
	19B209260P18	Solderless terminal: sim to AMP 41125. (Quantity 2).
		LOCAL CONTROL POWER CABLE 19C303640G3 12 VOLT 19C303640G4 6 VOLT
		----- MISCELLANEOUS -----
	4034405P3	Plug: 3 sockets; sim to Cannon XLR-3-11C.
	19A115067P1	Cable, 2-conductor: approx 10 feet; sim to Belden 31713.
	19A115776P2	Fuseholder: sim to Bussmann Type HHJ.
	7484390P3	Fuse, cartridge: 15 amp 250 v; sim to Littelfuse 314015 or Bussmann ABC-15.
	19B209260P27	Solderless terminal: sim to AMP 31828-LOOSE PC.
	19A115776P4	Contact, electrical: sim to Littelfuse 904-87.
		DC TRICKLE CHARGE CABLE 19B204993G2
		----- MISCELLANEOUS -----
	7160478P1	Cable: 2-conductors: approx 50 inches; sim to Birnbach 789.
	4034405P5	Plug: 5 sockets; sim to Cannon Electric XLR-5-11C.
	19A115513P1	Connector, cigarette lighter: 12 VDC; sim to Cole-Herssee 1624.
		AC CHARGING CABLE 5492570G2
		----- MISCELLANEOUS -----
C1	7489159P16	Capacitor, metallized plastic: 4 $\mu$ f $\pm$ 20%, 200 VDCW; sim to Sprague Type 118.
	4034403P1	Plug: sim to GE 4304-3.

SYMBOL	GE PART NO.	DESCRIPTION
	7160478P1	Cable, 2-conductor: approx 87 inches; sim to Birnbach 789.
	4034405P5	Plug: 5 sockets: sim to Cannon Electric XLR-5-11C.
		POWER SUPPLY EXTENSION CABLE 19B204289G1
----- MISCELLANEOUS -----		
	7473192P19	Receptacle: 8 terminals; sim to HB Jones 261-32-08-030.
	7473192P26	Plug: 8 terminals; sim to HB Jones 261-31-08-030.
	7162441P23	Sleeving, electrical: approx 7/16 inch dia.



## PRODUCTION CHANGES

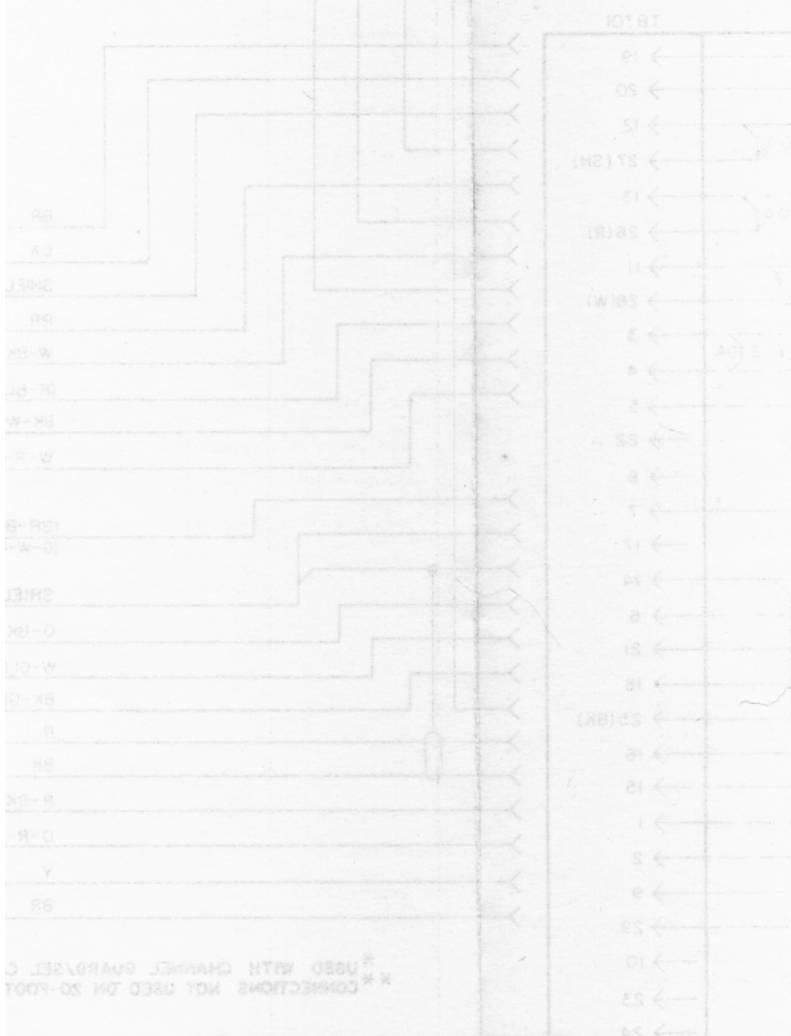
Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

### 10-WATT POWER AMPLIFIER 19E205165-G1

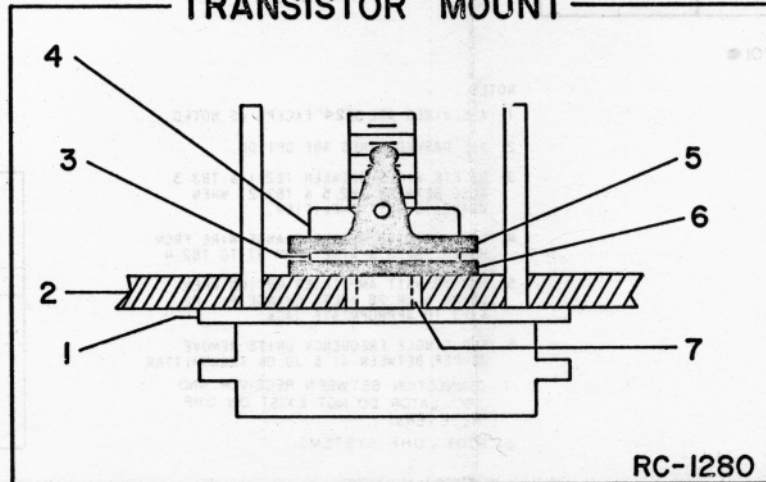
REV. A - To improve audio response. Changed R1 and added R6 on 10-Watt Audio Amplifier.

### TRANSMITTER-RECEIVER TOP PANEL 19D402599-G1

REV. A - To incorporate an improved relay. Changed K901.



## TRANSISTOR MOUNT



**PARTS LIST**

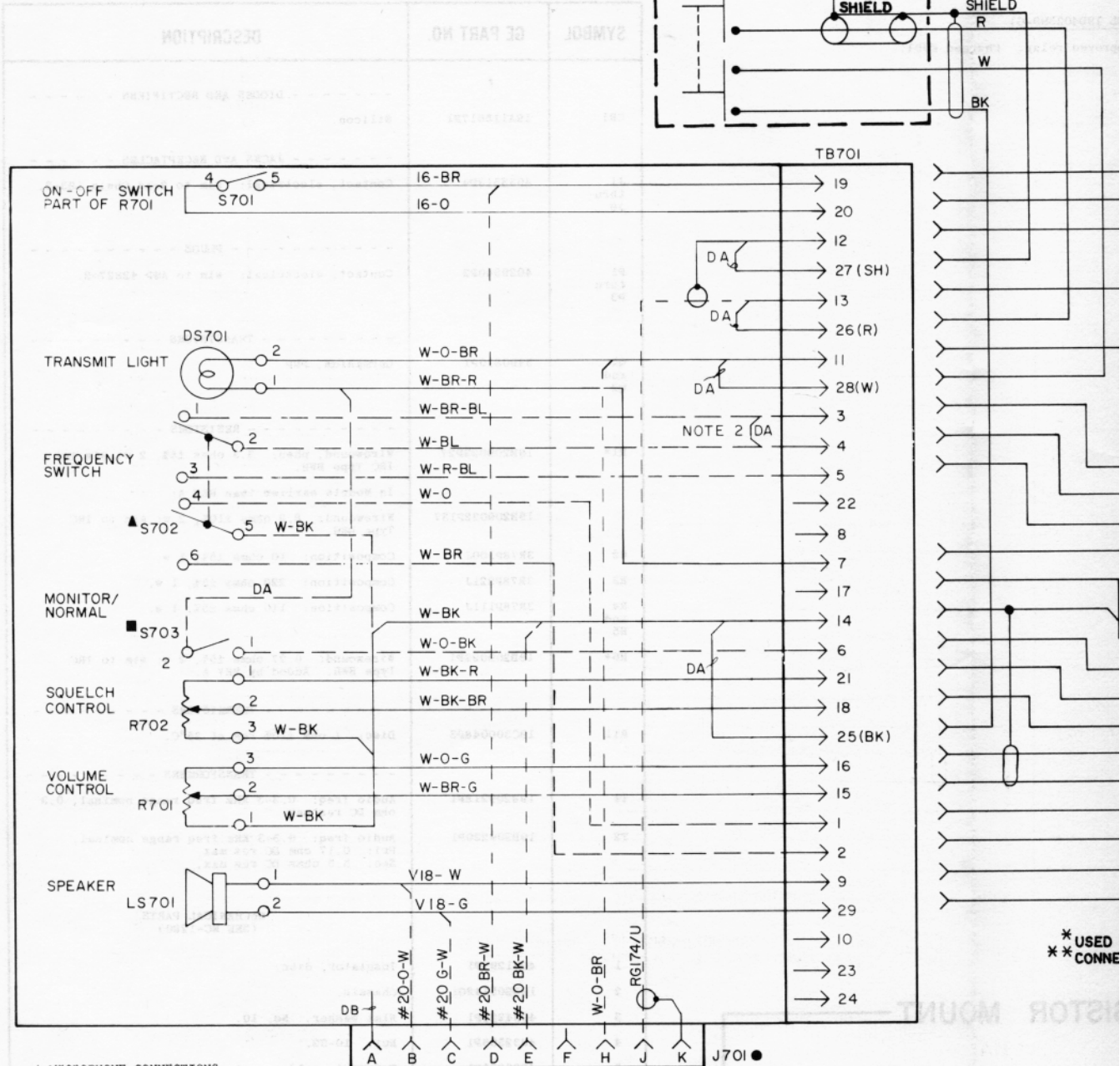
LBI-3669E  
 10-WATT POWER AMPLIFIER  
 19B205165G1

SYMBOL	GE PART NO.	DESCRIPTION
CR1	19A115617P1	----- DIODES AND RECTIFIERS ----- Silicon.
J1 thru J9	4033513P4	----- JACKS AND RECEPTACLES ----- Contact, electrical: sim to Bead Chain L93-3.
P1 thru P3	4029840P2	----- PLUGS ----- Contact, electrical: sim to AMP 42827-2.
Q1 and Q2	5490810P1	----- TRANSISTORS ----- Germanium, PNP.
R1*	19B209022P27	----- RESISTORS ----- Wirewound, phen: 3.3 ohms $\pm 5\%$ , 2 w; sim to IRC Type BWH. In Models earlier than REV A:
	19B209022P137	Wirewound: 8.2 ohms $\pm 10\%$ , 2 w; sim to IRC Type BWH.
R2	3R78P100J	Composition: 10 ohms $\pm 5\%$ , 1 w.
R3	3R78P221J	Composition: 220 ohms $\pm 5\%$ , 1 w.
R4 and R5	3R78P111J	Composition: 110 ohms $\pm 5\%$ , 1 w.
R6*	19B209022P1	Wirewound: 0.27 ohms $\pm 5\%$ , 2 w; sim to IRC Type BWH. Added by REV A.
RT1	19C300048P3	----- THERMISTORS ----- Disc: 1 ohm $\pm 10\%$ res at 25°C.
T1	19B209218P1	----- TRANSFORMERS ----- Audio freq: 0.3-3 KHz freq range nominal, 0.3 ohm DC res max.
T2	19B209220P1	Audio freq: 0.3-3 KHz freq range nominal, Pri: 0.17 ohm DC res max, Sec: 5.5 ohms DC res max.
		MECHANICAL PARTS (SEE RC-1280)
1	4031291P1	Insulator, disc.
2	19B205142G1	Chassis.
3	4034225P1	Flat washer. No. 10.
4	4032596P1	Nut: 10-32.
5	4036835P1	Terminal, solder: sim to Shakeproof 2118-10-01-2520N.
6	19A115221P3	Washer, mica: approx 9/16 inch dia.
7	4034215P1	Bushing.

\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

# EXTENDED LOCAL CONTROL UNIT

SECTION CHANGES **E**



**\* MICROPHONE CONNECTIONS**

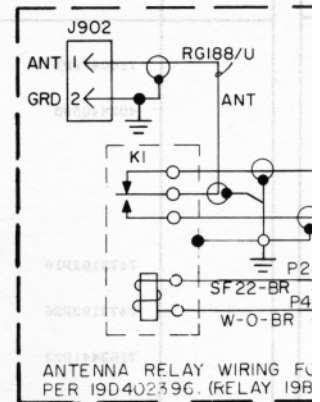
- TB701-28 PTT (W)
- TB701-27 MIKE LO (SH)
- TB701-26 MIKE HI (R)
- TB701-25 GROUND (BK)

- ▲ S702 USED ONLY IN MODELS 4EC66A11, 13, 15 & 17
  - S703 USED ONLY IN MODELS 4EC66A12, 13, 16 & 17
  - L701 USED ONLY IN MODELS 4EC66A14, 15, 16, 17
- NOTES:  
 1. ALL WIRES SF24 UNLESS OTHERWISE SPECIFIED.  
 2. DELETE IN MODELS 4EC66A11, 13, 15 & 17

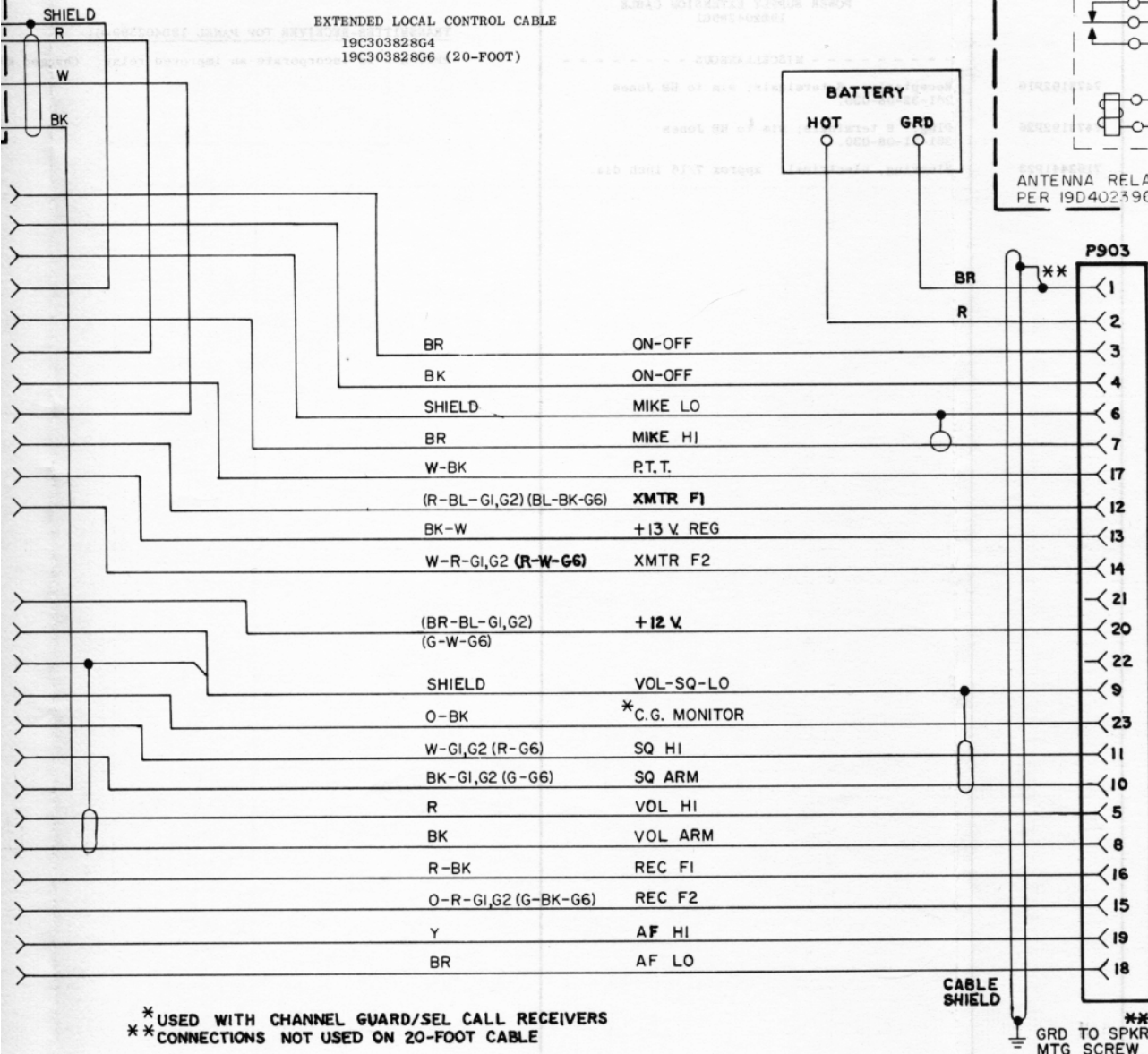
**NOTES:**

- ALL WIRES ARE SF24 EX
- ALL DASHED LINES ARE
- DELETE WIRES BETWEEN ALSO BETWEEN TB2 5 & USING 10 WATT AMPLIFI
- FOR POSITIVE GROUND C H6 TO TB2-3 & WIRE FR
- FOR 10 WATT AMPLIFIER USING 6 OR 28 VOLTS C & P3 TO APPROPRIATE
- FOR SINGLE FREQUENCY JUMPER BETWEEN J1 & J
- CONNECTION BETWEEN OSCILLATOR DO NOT E RECE VERS.
- P303 - UHF SYSTEMS

# EXTENDED LOCAL CONTROL CABLE



DETAIL FOR UHF



\* USED WITH CHANNEL GUARD/SEL CALL RECEIVERS  
 \*\* CONNECTIONS NOT USED ON 20-FOOT CABLE

RC-1262C

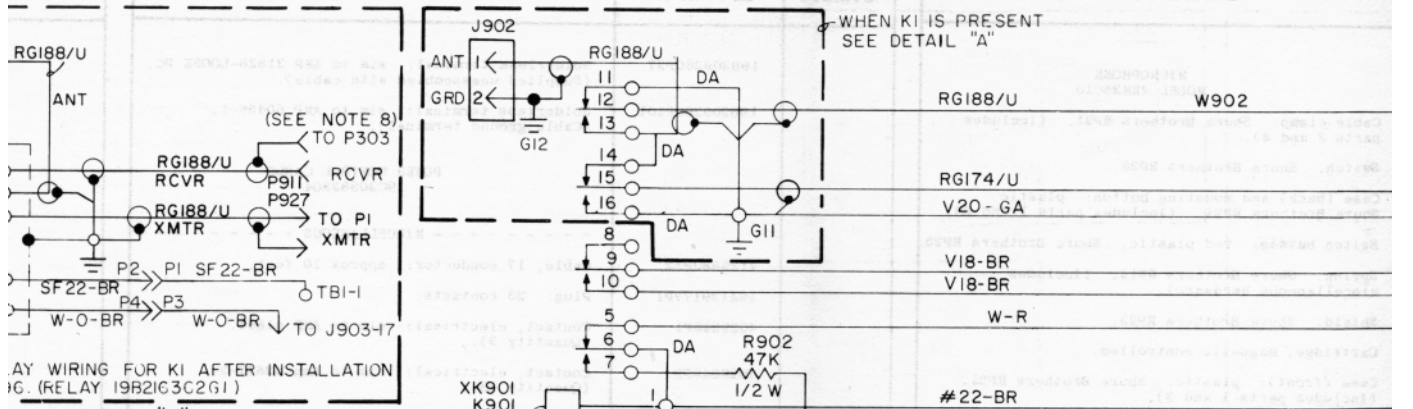
NOTES:

1. ALL WIRES ARE SF24 EXCEPT AS NOTED.
2. ALL DASHED LINES ARE OPTION.
3. DELETE WIRES BETWEEN TB2-1 & TB3-3, ALSO BETWEEN TB2-5 & TB3-2, WHEN USING 10 WATT AMPLIFIER.
4. FOR POSITIVE GROUND CHANGE WIRE FROM H6 TO TB2-3 & WIRE FROM H7 TO TB2-4
5. FOR 10 WATT AMPLIFIER OPTION WHEN USING 6 OR 28 VOLTS CHANGE P1, P2 & P3 TO APPROPRIATE JACK.
6. FOR SINGLE FREQUENCY UNITS REMOVE JUMPER BETWEEN J1 & J9 ON TRANSMITTER
7. CONNECTION BETWEEN RECEIVER AND OSCILLATOR DO NOT EXIST ON UHF RECEIVERS.
8. P303 - UHF SYSTEMS

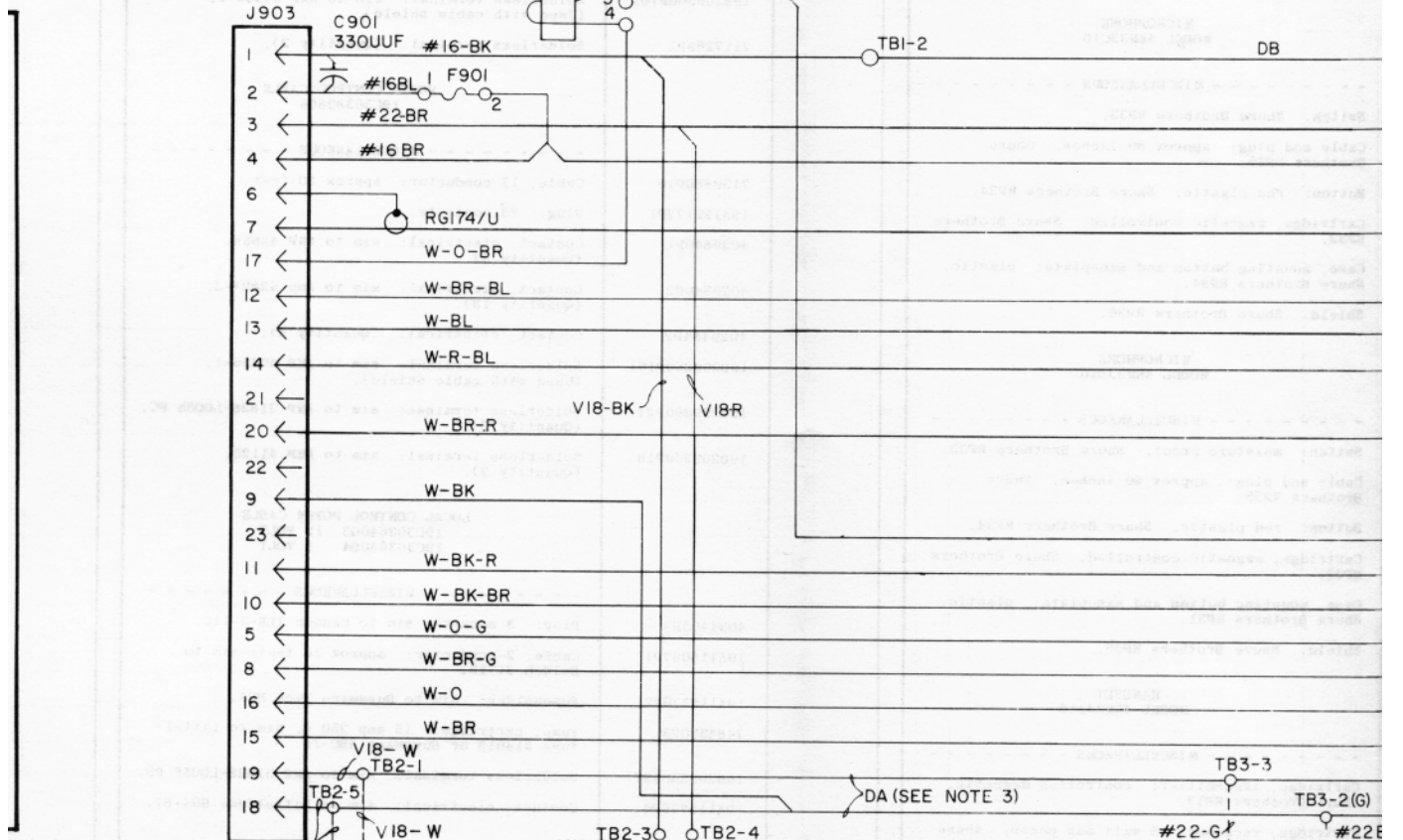
SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.	
THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
PL19B205165GI	A
PL19D402599GI	B

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

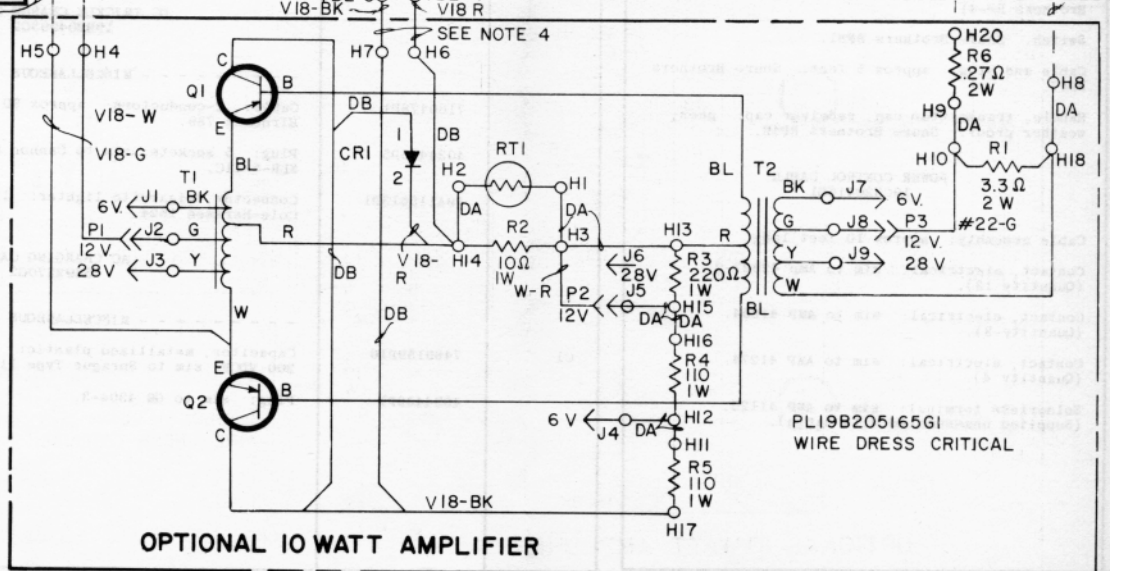
# TRANSMITTER-RECEIVER TO



DETAIL "A"  
FOR UHF SYSTEMS

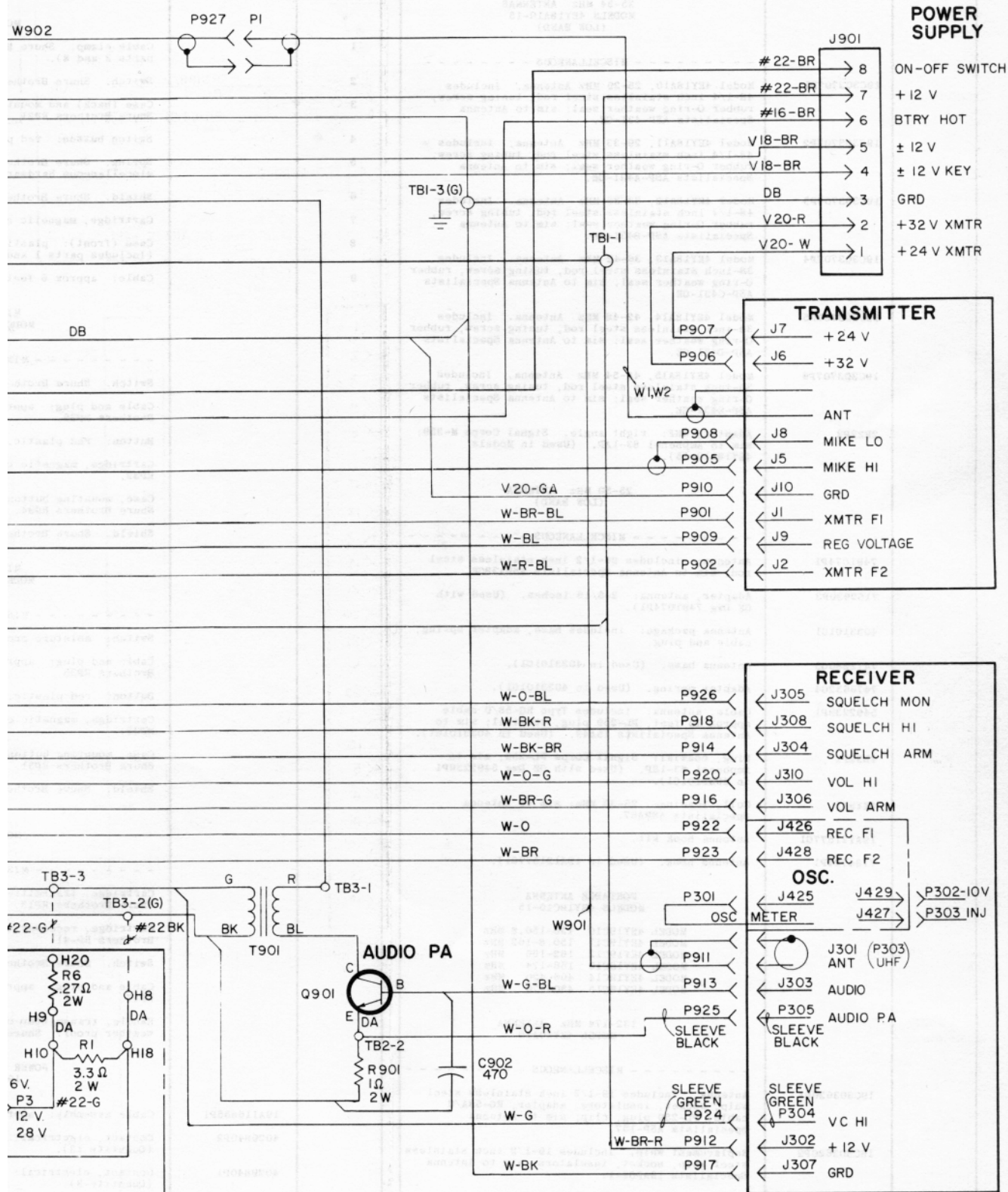


EQUIPMENT  
OF ANY  
TYPE  
SHOULD BE  
USED ONLY WITH  
SPECIFICATIONS  
OR THAT PART.





# CEIVER TOP PANEL



165G1  
SS CRITICAL

(19D402596, Rev. 14)

## SERVICE SHEET

EXTENDED LOCAL CONTROL UNIT  
MODELS 4EC66A10,11,14 & 15  
AND TRANSMITTER-RECEIVER TOP PANEL  
PL-19D402599-G1 (Used with 6/12 Volt  
Power Supplies)

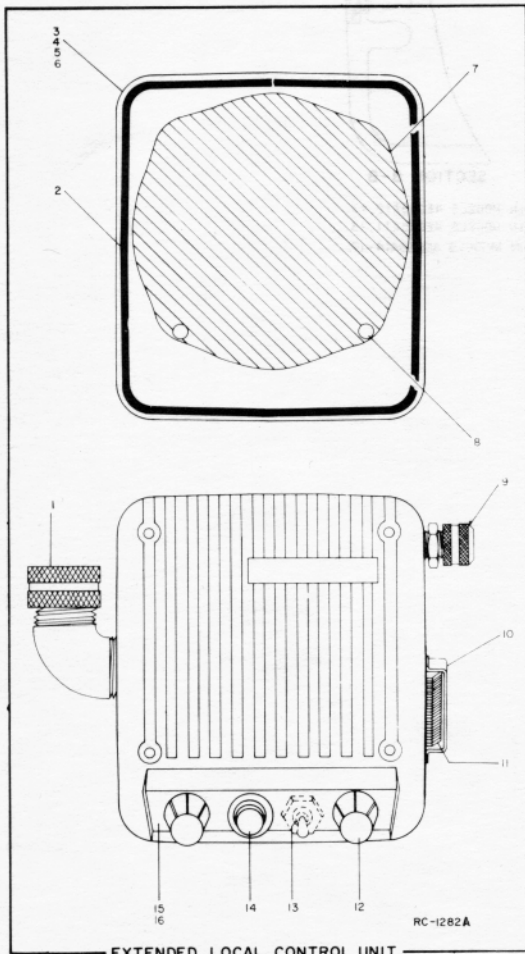
(RC-1263J, Sheet 2)

**PARTS LIST**

LBI-3681D

CONTROL UNIT  
 MODEL 4EC66A10 (19D402603G1) (1 Frequency)  
 MODEL 4EC66A11 (19D402603G2) (2 Frequency)  
 MODEL 4EC66A14 (19D402603G5) (1 Frequency with ACCESSORY JACK OPTION)  
 MODEL 4EC66A15 (19D402603G6) (2 Frequency with ACCESSORY JACK OPTION)  
 TRANSMITTER-RECEIVER TOP PANEL 19D402599G4  
 AND  
 ASSOCIATED ASSEMBLIES

SYMBOL	GE PART NO.	DESCRIPTION
		----- INDICATING DEVICES -----
DS701	19C307037P4	Lamp, incandescent: 14 v; sim to GE 1815.
		----- JACKS AND RECEPTACLES -----
J701	7489183P5	Connector: 9 contacts; sim to Winchester M9S-LRN. (Used in Models 4EC66A14, 15).
		----- LOUDSPEAKERS -----
LS701	5491260P7	Permanent magnet, 5-inch: 3.2 ohms $\pm 10\%$ voice coil imp, 15 w max operating, 385 Hz $\pm 15\%$ resonance, paper dust cap; sim to Jensen Model P5-VAS12761.
		----- RESISTORS -----
R701	19B209256P2	Resistor/switch: includes Resistor, variable, 5000 ohms $\pm 20\%$ , 0.25 w; Switch (S701), rotary, SPST, 15 amps at 10 v; sim to CTS Series 45.
R702	19B209256P1	Variable, carbon film: 5000 ohms $\pm 20\%$ , 0.5 w; sim to CTS Series 45.
		----- SWITCHES -----
S701		(Part of R701).
S702	5491899P6	Toggle: DPDT, 3 amps at 250 v; sim to Cutler-Hammer 8363K7. (Used in Model 4EC66A11, 15).
		----- TERMINAL BOARDS -----
TB701	19B205152G1	Terminal board: 25 contacts.
		----- SOCKETS -----
XDS701	7141855P15	Lamp: sim to Dialight 95-410-975 (modified).
		HARNES ASSEMBLY 19D402603G9 (4EC66A10) 19D402603G10 (4EC66A11) 19D402603G13 (4EC66A14) 19D402603G14 (4EC66A15)
		MECHANICAL PARTS (SEE RC-1282)
1	19A122065P1	Bushing: 3/4-14; sim to Pyle-National DB-1191690 (modified).
2	4032574P2	Gasket, cover, neoprene.
3	19D402601P1	Casting. (Used in Model 4EC66A10).
4	19D402601P2	Casting. (Used in Model 4EC66A11).
5	19D402601P5	Casting. (Used in Model 4EC66A14).
6	19D402601P6	Casting. (Used in Model 4EC66A15).
7	19B205162P1	Diaphragm: approx 2-3/8 inches dia.
8	19A121990P1	Spacer. (Used with TB701).
9	19A122066P1	Bushing; sim to Pyle-National DB-44516 (modified).
10	4031457P1	Support. (Used with microphone).
11	4031458P1	Spring. (Used with microphone).
12	4039182G1	Knob. (Used with R701, 702).
13	5490135P4	Boot: 15/32-32; sim to APM-Hexseal N-1030-B. (Used with S702 in Models 4EC66A11, 15).
14	19A115040P9	Lens, panel light: red lens; sim to Dialight 81-331. (Used with DS701).



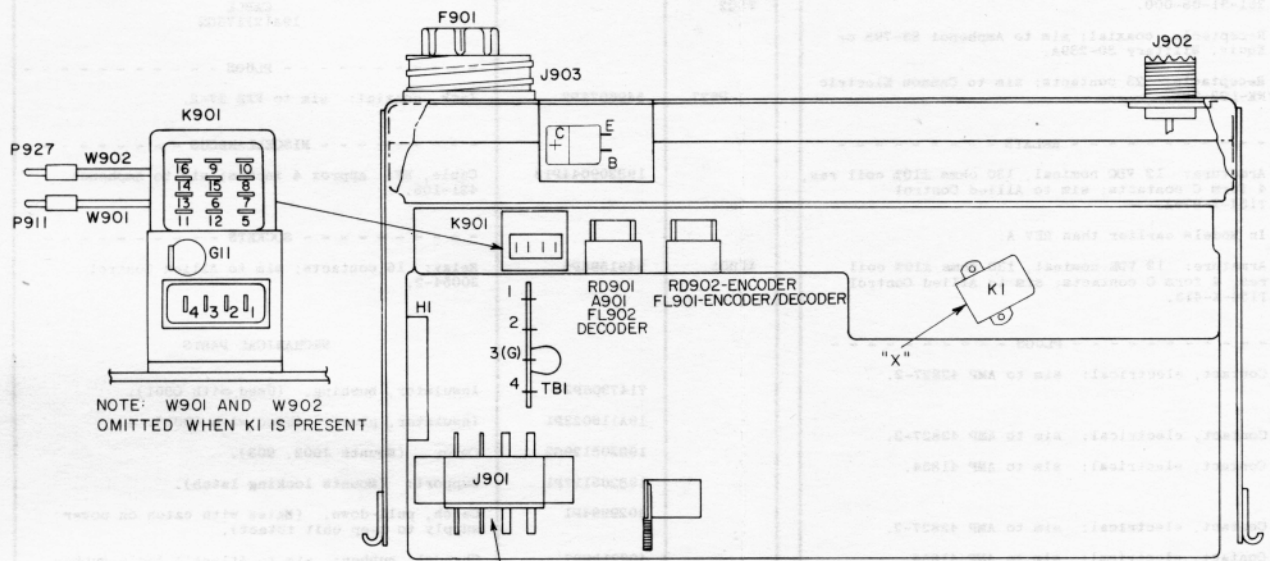
\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	G-E PART NO	DESCRIPTION
15	NP248843	Nameplate. (Used in Models 4EC66A11, 15).
16	NP248844	Nameplate. (Used in Models 4EC66A10, 14).
		TRANSMITTER-RECEIVER TOP PANEL 19D402599G4
		----- CAPACITORS -----
C902	5494481P7	Ceramic disc: 470 pf $\pm 20\%$ , 1000 VDCW; sim to RMC Type JF Discap.
		----- JACKS AND RECEPTACLES -----
J901	7473192P31	Connector, phen: 8 terminals; sim to HB Jones 261-31-08-000.
J902	4029493P1	Receptacle, coaxial; sim to Amphenol 83-798 or Equiv. Military SO-239A.
J903	19B200010P2	Receptacle: 23 contacts; sim to Cannon Electric NK-L23-32S.
		----- RELAYS -----
K901*	19C307010P18	Armature: 12 VDC nominal, 130 ohms $\pm 10\%$ coil res, 4 form C contacts; sim to Allied Control T154-X-976A.  In Models earlier than REV A:
	19C307010P5	Armature: 12 VDE nominal, 130 ohms $\pm 10\%$ coil res, 4 form C contacts; sim to Allied Control T154-X-413.
		----- PLUGS -----
P901 and P902	4029840P2	Contact, electrical: sim to AMP 42827-2.
P905	4029840P2	Contact, electrical: sim to AMP 42827-2.
P906 thru P908	4029840P1	Contact, electrical: sim to AMP 41854.
P909	4029840P2	Contact, electrical: sim to AMP 42827-2.
P910	4029840P1	Contact, electrical: sim to AMP 41854.
P912 thru P914	4029840P2	Contact, electrical: sim to AMP 42827-2.
P916 thru P918	4029840P2	Contact, electrical: sim to AMP 42827-2.
P920	4029840P2	Contact, electrical: sim to AMP 42827-2.
P922 and P923	4029840P2	Contact, electrical: sim to AMP 42827-2.
P924 and P925	7147199P2	Connector: female contact; sim to Winchester Electronics 21804.
P926	4029840P2	Contact, electrical: sim to AMP 42827-2.
		----- TRANSISTORS -----
Q901*	19A116118P3	Silicon, NPN.  In REV A and earlier:
	19A115527P1	Silicon, NPN.
		----- RESISTORS -----
R901	19B209022P115	Wirewound: 1 ohm $\pm 10\%$ , 2 w; sim to IRC Type BWH.
R902	3R77P473K	Composition: 47,000 ohms $\pm 10\%$ , 1/2 w.
		----- TRANSFORMERS -----
T901	19B209079P1	Audio freq: 0.3-3 KHz freq range, Pri: 55 ohms $\pm 10\%$ imp, 0.895 ohm $\pm 10\%$ DC res, Sec: 3.2 ohms imp, 0.168 ohm DC res.
		----- TERMINAL BOARDS -----
TB1	7775500P8	Phen: 4 terminals.
TB2	7775500P11	Phen: 5 terminals.
TB3	7775500P7	Phen: 3 terminals.

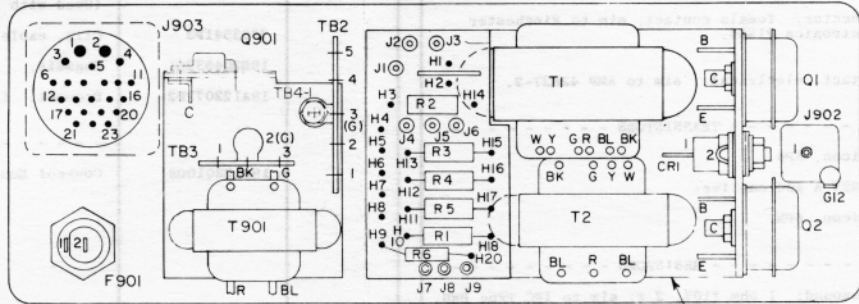
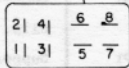
SYMBOL	G-E PART NO	DESCRIPTION
		----- CABLES -----
W901		CABLE 19A121176G1
		----- PLUGS -----
P911	5496078P1	Push-on, coaxial: sim to FXR 27-1.
		----- MISCELLANEOUS -----
	19B209044P11	Cable, RF: approx 6 inches; sim to Amphenol 21-598.
W902		CABLE 19A121176G2
		----- PLUGS -----
P927	5496078P2	Jack, coaxial: sim to FXR 27-2.
		----- MISCELLANEOUS -----
	19B209044P13	Cable, RF: approx 4 inches; sim to Amphenol 421-105.
		----- SOCKETS -----
XK901	5491595P5	Relay: 16 contacts; sim to Allied Control 30054-2.
		MECHANICAL PARTS
	7147306P2	Insulator, bushing. (Used with Q901).
	19A116023P1	Insulator, plate. (Used with Q901).
	19B205129G2	Cover. (Mounts J902, 903).
	19B205127P1	Support: (Mounts locking latch).
	4029994P1	Catch, pull-down. (Mates with catch on power supply to keep unit intact).
	4037158P7	Channel, rubber: sim to Atlantic India Rubber X661. (Located above J901).
	4032574P2	Gasket, cover, neoprene.
	19A121981G1	Chassis. (Mounts T901, TB2, 3).
	7763541P5	Clip, cable. (Located by J903).
	19A121178P1	Support. (Used with J901).
	5491595P9	Clip, relay: sim to Allied Control 30040-2. (Used with K901).
	5491595P10	Clip, relay: sim to Allied Control 30052-1. (Used with XK901).
	7763541P3	Clip, cable. (Located by XK901).
	19B204532G1	Chassis.
	19A122071P2	Grommet. (Located by K901).
		----- ASSOCIATED ASSEMBLIES -----
	19A122010G2	Control Mounting Kit.
		ANTENNA RELAY KIT 19B216362G1 (Includes J902 and K1)
		132-470 MHZ ANTENNA MODEL 4EY12A13
		----- MISCELLANEOUS -----
		Antenna: includes 20-inch stainless steel whip, whip socket, antenna cable, cable adapter, PL-259 plug; sim to Antenna Specialists ASPD201GE or Danbury-Knudsen Type PA-25.
	5490969P4	Whip: 20-inch stainless steel.
	5490969P5	Socket, whip.
	5490969P6	Whip and whip socket: 20-inch stainless steel whip, whip socket.
		Cable, antenna: approx 15 feet. Type RG-58/U. (Used with GE Dwg 2R22P1 and GE Dwg 7105381P1).

(Cont'd on back of Sheet 2)



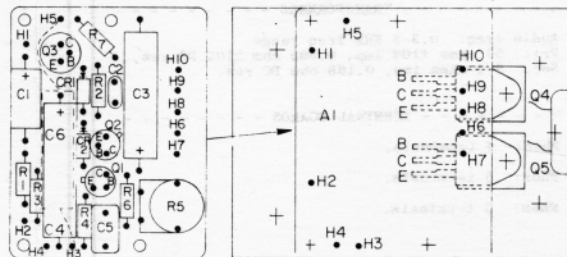


SIDE VIEW-TOP PANEL



COMPONENT VIEW-TOP COVER PANEL

10-WATT AUDIO AMPLIFIER (USED WITH 24)



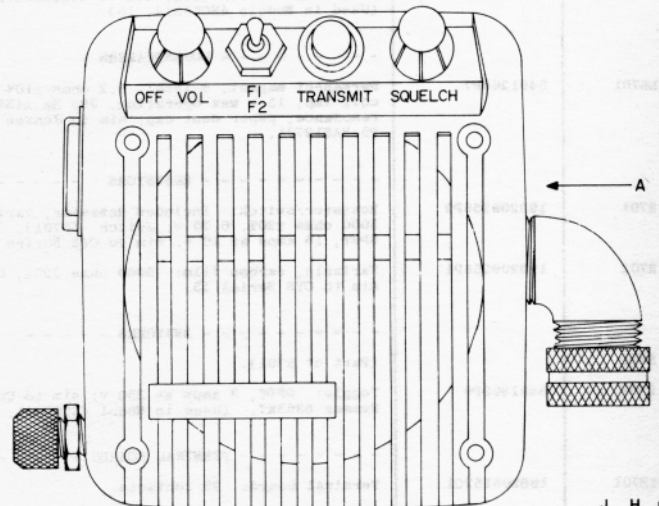
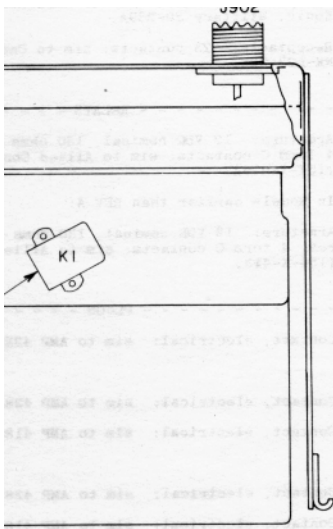
10-WATT AUDIO AMPLIFIER (USED WITH 24)

## SERVICE SHEET

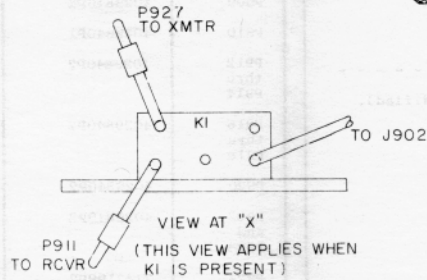
EXTENDED LOCAL CONTROL UNIT  
 MODELS 4EC66A10,11,14 & 15 AND  
 TRANSMITTER-RECEIVER TOP PANEL  
 PL-19D402599-G4 (Used with 24/36 Volt  
 Power Supply)

(RC-1365F, Sheet 1)

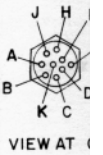




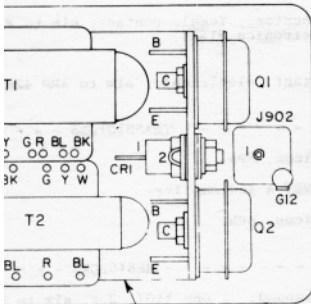
FRONT VIEW



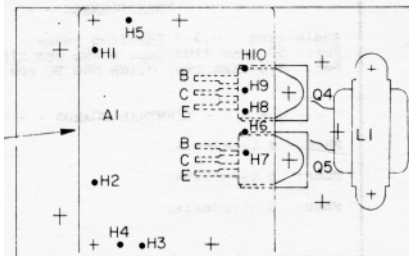
VIEW AT "X"  
(THIS VIEW APPLIES WHEN  
K1 IS PRESENT)



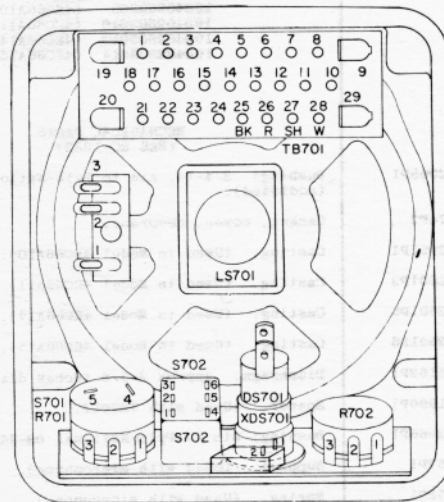
VIEW AT "A"



PANEL  
10-WATT AUDIO AMPLIFIER (USED WITH 6/12V POWER SUPPLY)



10-WATT AUDIO AMPLIFIER (USED WITH 24/36 V POWER SUPPLY)



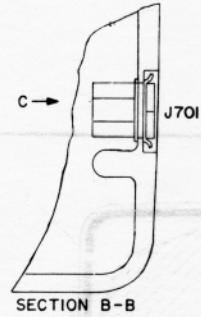
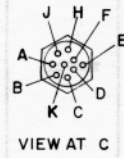
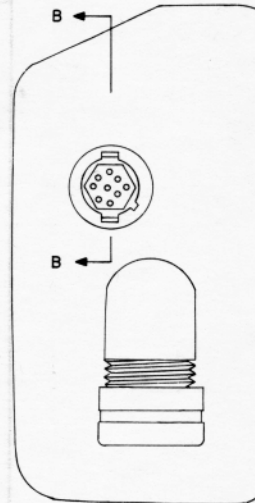
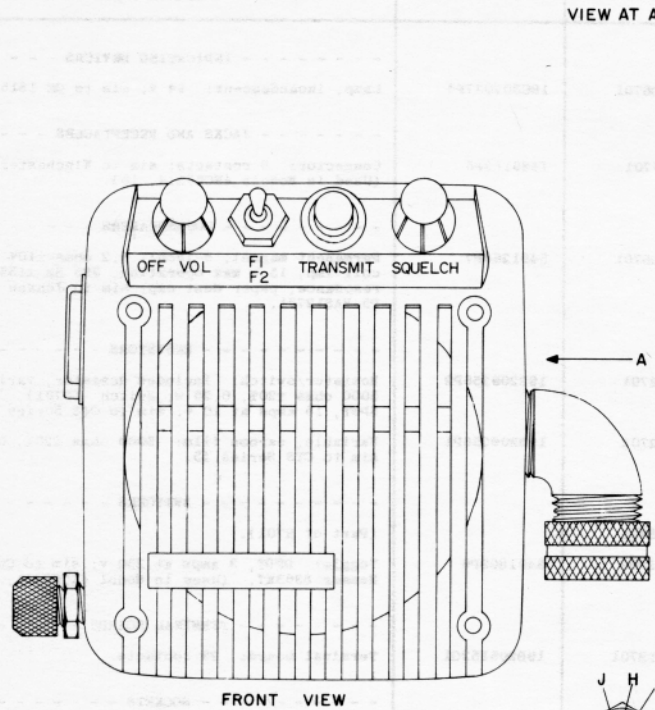
MONITOR NORMAL (OPTIONAL)  
S703

BACK VIEW

EXTENDED LOCAL CONTROL UNIT

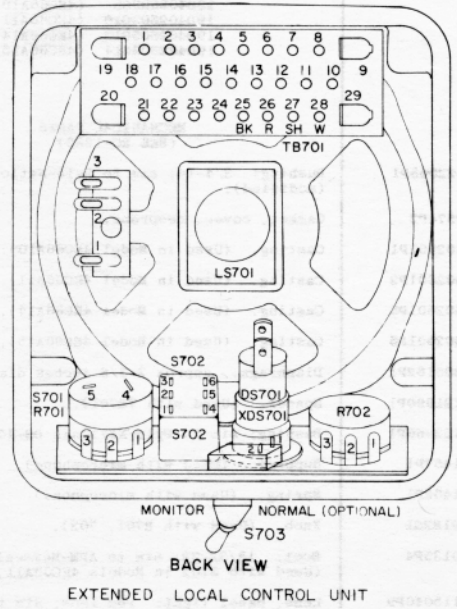
- NOTES:  
1. S703 USE  
2. S702 USE  
3. J701 USE

PL19B205165  
PL19D402599



TO J902

X"  
(APPLIES WHEN  
ENT)



- NOTES:
1. S703 USED ONLY IN MODELS 4EC66A12, 13.
  2. S702 USED ONLY IN MODELS 4EC66A11, 13.
  3. J701 USED ONLY IN MODELS 4EC66A14-17.

SYMBOL	G-E PART NO	DESCRIPTION
	7105381P1	Adapter cable: 1 x 7/16 inches dia. Type UG-175/U. (Used with GE Dwg 2R22P1 and Type RG-58/U cable).
	2R22P1	Plug, coaxial: Signal Corps PL-259; sim to Amphenol 83-1SP. (Used with GE Dwg 7105381P1 and Type RG-58/U cable).
		25-54 MHz ANTENNAS MODELS 4EY18A10-15 (LOW BAND)
		----- MISCELLANEOUS -----
	19C303707P1	Model 4EY18A10, 25-29 MHz Antenna. Includes 48-1/4 inch stainless steel rod, tuning screw, rubber O-ring weather seal; sim to Antenna Specialists ASP-431-GE.
	19C303707P2	Model 4EY18A11, 29-33 MHz Antenna. Includes 48-1/4 inch stainless steel rod, tuning screw, rubber O-ring weather seal; sim to Antenna Specialists ASP-A431-GE.
	19C303707P3	Model 4EY18A12, 33-36 MHz Antenna. Includes 48-1/4 inch stainless steel rod, tuning screw, rubber O-ring weather seal; sim to Antenna Specialists ASP-B431-GE.
	19C303707P4	Model 4EY18A13, 36-42 MHz Antenna. Includes 38-inch stainless steel rod, tuning screw, rubber O-ring weather seal; sim to Antenna Specialists ASP-C431-GE.
	19C303707P5	Model 4EY18A14, 42-48 MHz Antenna. Includes 38-inch stainless steel rod, tuning screw, rubber O-ring weather seal; sim to Antenna Specialists ASP-D431-GE.
	19C303707P6	Model 4EY18A15, 48-54 MHz Antenna. Includes 38-inch stainless steel rod, tuning screw, rubber O-ring weather seal; sim to Antenna Specialists ASP-E431-GE.
	2R22P2	Adapter, UHF: right angle. Signal Corps M-359; sim to Amphenol 83-1AP. (Used in Models 4EY18A10-15).
		25-50 MHz ANTENNA (LOW BAND)
		----- MISCELLANEOUS -----
	7491074P1	Antenna: includes 96-1/2 inch stainless steel rod; sim to Antenna Specialists ASPA3BGE.
	7102930P3	Adapter, antenna: 2-5/16 inches. (Used with GE Dwg 7491074P1).
	4033101G1	Antenna package: includes base, adapter spring, cable and plug.
	7472880G5	Antenna base. (Used in 4033101G1).
	7476632G4	Adapter spring. (Used in 4033101G1).
	5492239P1	Cable, antenna: includes Type RG-58/U cable approx 15 feet, PL-259 plug, terminal; sim to Antenna Specialists 15A43. (Used in 4033101G1).
	2R22P1	Plug, coaxial: Signal Corps PL-259; sim to Amphenol 83-1SP. (Used with GE Dwg 5492239P1 in 4033101G1).
	4KY9A1	Coil, loading: 25-33 MHz; sim to Antenna Specialists ASPA87.
	19A121577G1	Antenna hook kit.
	7134724P1	Antenna hook. (Used in 19A121577G1).
		PORTABLE ANTENNA MODELS 4EY19C10-15
		MODEL 4EY19C10 130-150.8 MHz MODEL 4EY19C11 150.8-162 MHz MODEL 4EY19C12 162-166 MHz MODEL 4EY19C13 166-174 MHz MODEL 4EY19C14 406-420 MHz MODEL 4EY19C15 450-470 MHz
		132-174 MHz ANTENNA MODEL 4EY20A10
		----- MISCELLANEOUS -----
	19C303620P1	Antenna. Includes 19-1/2 inch stainless steel whip, socket, insulators, adapter, RG-58A/U cable, PL-259 plug, clip; sim to Antenna Specialists ASP-157.

SYMBOL	G-E PART NO	DESCRIPTION
	19C303620P2	Replacement whip. Includes 19-1/2 inch stainless steel whip, socket, insulators; sim to Antenna Specialists 19A904-1.
1		MICROPHONE MODEL 4EM25C10 Cable clamp. Shure Brothers RP21. (Includes parts 3 and 8).
2		Switch. Shure Brothers RP26.
3		Case (back) and mounting button: plastic. Shure Brothers RP21. (Includes parts 1 and 8).
4		Switch button: red plastic. Shure Brothers RP25.
5		Spring. Shure Brothers RP16. (Includes miscellaneous hardware).
6		Shield. Shure Brothers RP23.
7		Cartridge, magnetic controlled.
8		Case (front): plastic. Shure Brothers RP21. (Includes parts 1 and 3).
9		Cable: approx 6 feet.
		MICROPHONE MODEL 4EM33C10 ----- MISCELLANEOUS ----- Switch. Shure Brothers RP33. Cable and plug: approx 80 inches. Shure Brothers RP35. Button: red plastic. Shure Brothers RP34. Cartridge, magnetic controlled. Shure Brothers RP32. Case, mounting button and nameplate: plastic. Shure Brothers RP94. Shield. Shure Brothers RP36.
		MICROPHONE MODEL 4EM33D10 ----- MISCELLANEOUS ----- Switch: moisture proof. Shure Brothers RP33. Cable and plug: approx 80 inches. Shure Brothers RP35. Button: red plastic. Shure Brothers RP34. Cartridge, magnetic controlled. Shure Brothers RP32. Case, mounting button and nameplate: plastic. Shure Brothers RP31. Shield. Shure Brothers RP36.
		HANDSET MODEL 4EM34A10 ----- MISCELLANEOUS ----- Cartridge, transmitter: controlled magnetic. Shure Brothers RP13. Cartridge, receiver: 3 watt max power. Shure Brothers RP41. Switch. Shure Brothers RP81. Cable and plug: approx 5 feet. Shure Brothers RP47. Handle, transmitter cap, receiver cap: phen, weather proof. Shure Brothers RP49.
		POWER CONTROL CABLE 19C303828G4 ----- MISCELLANEOUS -----
	19A115067P1	Cable, 2 conductor: approx 10 feet; sim to Belden 31713.
	19B200010P3	Plug: 23 contacts; sim to Cannon Electric NK-L23-23C-3/4.

SYMBOL	G-E PART NO	DESCRIPTION
		POWER CONTROL CABLE 19C303828G5
		----- MISCELLANEOUS -----
	19A115067P3	Cable, 2 conductor: approx 23 feet; sim to Belden 7721.
	19B200010P3	Plug: 23 contacts; sim to Cannon Electric NK-L23-23C-3/4.
		DC TRICKLE CHARGE CABLE 19B204993G2
		----- MISCELLANEOUS -----
	7160478P1	Cable: 2 conductors: approx 50 inches; sim to Birnbach 789.
	4034405P5	Plug: 5 sockets; sim to Cannon Electric XLR-5-11C.
	19A115513P1	Connector, cigarette lighter: 12 VDC; sim to Cole-Herssee 1624.
		POWER CABLE 19B205422G1
		----- MISCELLANEOUS -----
	19A115067P1	Cable, 2 conductor: approx 10 feet; sim to Belden 31713.
	19A115776P2	Phenolic: sim to Bussman Type HHJ.
	IR16P7	Quick blowing: 4 amps at 250 v; sim to Littelfuse 312004 or Bussman MTH-4.
	4034405P3	Plug: 3 sockets; sim to Cannon Electric XLR-3-11C.
		POWER CABLE 19B205422G2
		----- MISCELLANEOUS -----
	19A115067P1	Cable, 2 conductor: approx 23 feet; sim to Belden 31713.
	19A115776P2	Phenolic: sim to Bussman Type HHJ.
	IR16P7	Quick blowing: 4 amps at 250 v; sim to Littelfuse 312004 or Bussman MTH-4.
	4034405P3	Plug: 3 sockets; sim to Cannon Electric XLR-3-11C.
		AC CHARGING CABLE 5492570G2
		----- MISCELLANEOUS -----
C1	7489159P16	Capacitor, metallized plastic: 4 $\mu$ f $\pm$ 20%, 200 VDCW; sim to Sprague 118P40502S4.
	4034403P1	Plug: sim to GE 4304-3.
	7160478P1	Cable, 2-conductor: approx 87 inches; sim to Birnbach 789.
	4034405P5	Plug: 5 sockets: sim to Cannon Electric XLR-5-11C.
		POWER SUPPLY EXTENSION CABLE 19B204289G1
		----- MISCELLANEOUS -----
	7473192P19	Receptacle: 8 terminals; sim to HB Jones 261-32-08-030.
	7473192P26	Plug: 8 terminals; sim to HB Jones 261-31-08-030.
	7162441P23	Sleeving, electrical: approx 7/16 inch dia.



**PARTS LIST**

LBI-4187B

10-WATT AMPLIFIER  
19C317598G1

SYMBOL	GE PART NO.	DESCRIPTION
A1		AMPLIFIER BOARD 19B219085G1
		----- CAPACITORS -----
C1	19A115680P3	Electrolytic: 20 $\mu$ f +150% -10%, 25 VDCW; sim to Mallory Type TT.
C2	5496219P47	Ceramic disc: 22 pf $\pm$ 5%, 500 VDCW, temp coef 0 PPM.
C3	19A115680P10	Electrolytic: 200 $\mu$ f +150% -10%, 18 VDCW; sim to Mallory Type TT.
C4	19A115680P9	Electrolytic: 120 $\mu$ f +150% -10%, 26 VDCW; sim to Mallory Type TT.
C5	19A115680P109	Electrolytic: 120 $\mu$ f +150% -10%, 26 VDCW; sim to Mallory Type TT.
C6*	19A115680P6	Electrolytic: 50 $\mu$ f +150% -10%, 50 VDCW; sim to Mallory Type TT. Added by REV A.
		----- DIODES AND RECTIFIERS -----
CR1 and CR2	4037822P1	Silicon.
		----- RESISTORS -----
R1	3R77P222K	Composition: 2200 ohms $\pm$ 10%, 1/2 w.
R2	3R77P563K	Composition: 56,000 ohms $\pm$ 10%, 1/2 w.
R3	3R77P153K	Composition: 15,000 ohms $\pm$ 10%, 1/2 w.
R4	3R77P391K	Composition: 390 ohms $\pm$ 10%, 1/2 w.
R5	19B209358P8	Variable, carbon film: approx 100 to 50,000 ohms $\pm$ 20%, 0.25 w; sim to CTS Type U-201.
R6	3R77P220K	Composition: 22 ohms $\pm$ 10%, 1/2 w.
R7	3R77P682K	Composition: 6800 ohms $\pm$ 10%, 1/2 w.
		----- TRANSISTORS -----
Q1	19A115300P1	Silicon, NPN; sim to Type 2N3053.
Q2	19A115562P1	Silicon, PNP.
Q3	19A115300P1	Silicon, NPN; sim to Type 2N3053.
		----- INDUCTORS -----
L1*	19A115686P1	Reactor: 2.5 mh ind, 0.5 ohm DC res max, 20 VDC operating. Added by REV A.
		----- TRANSISTORS -----
Q4 and Q5	19A116203P3	Silicon, NPN.
		----- MISCELLANEOUS -----
	19A115222P3	Insulator, bushing. (Used with Q4 and Q5).
	19A116023P2	Insulator, plate. (Used with Q4 and Q5).
	4036555P1	Insulator, disc: nylon. (Used with Q1-Q3).
	4035439P1	Heat Sink. (Used with Q3).

\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

## PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

### TRANSMITTER-RECEIVER TOP PANEL 19D402599-G1

REV. A - To incorporate an improved relay. Changed K901.

### CONTROL UNIT (4EC66A10-17)

REV. A - To eliminate noise in receiver at low volume control settings.  
Deleted jumpers between TB701-14 & TB701-17 and TB701-1 & TB701-17.

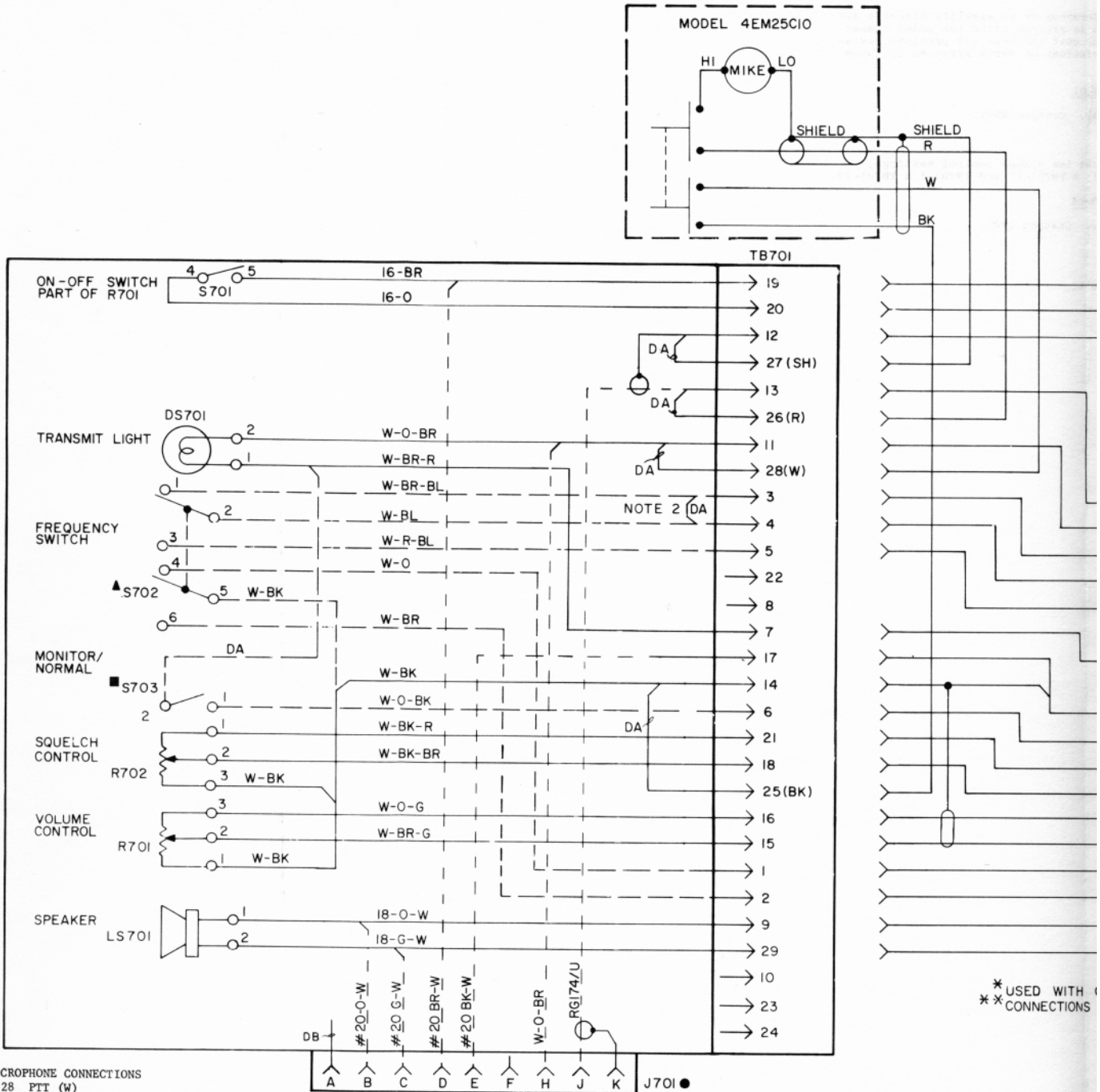
### TRANSMITTER-RECEIVER TOP PANEL 19D402599-G4

REV. B - To incorporate a new transistor. Changed Q901.

### 10 WATT AMPLIFIER BOARD 19C317598-G1

REV. A - To add filtering. Added C6 and L1.

# EXTENDED LOCAL CONTROL UNIT



- \* MICROPHONE CONNECTIONS  
 TB701-28 PTT (W)  
 TB701-27 MIKE LO (SH)  
 TB701-26 MIKE HI (R)  
 TB701-25 GROUND (BK)
- ▲ S702 USED ONLY IN MODELS 4EC66A11,13,15 & 17  
 ■ S703 USED ONLY IN MODELS 4EC66A12,13,16 & 17  
 ● J701 USED ONLY IN MODELS 4EC66A14, 15, 16, 17.
- NOTES:  
 1. ALL WIRES SF24 UNLESS OTHERWISE SPECIFIED  
 2. DELETE IN MODELS 4EC66A11,13,15 & 17

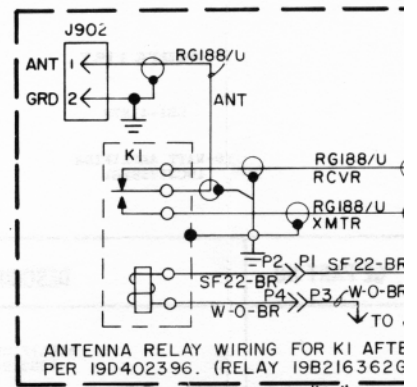
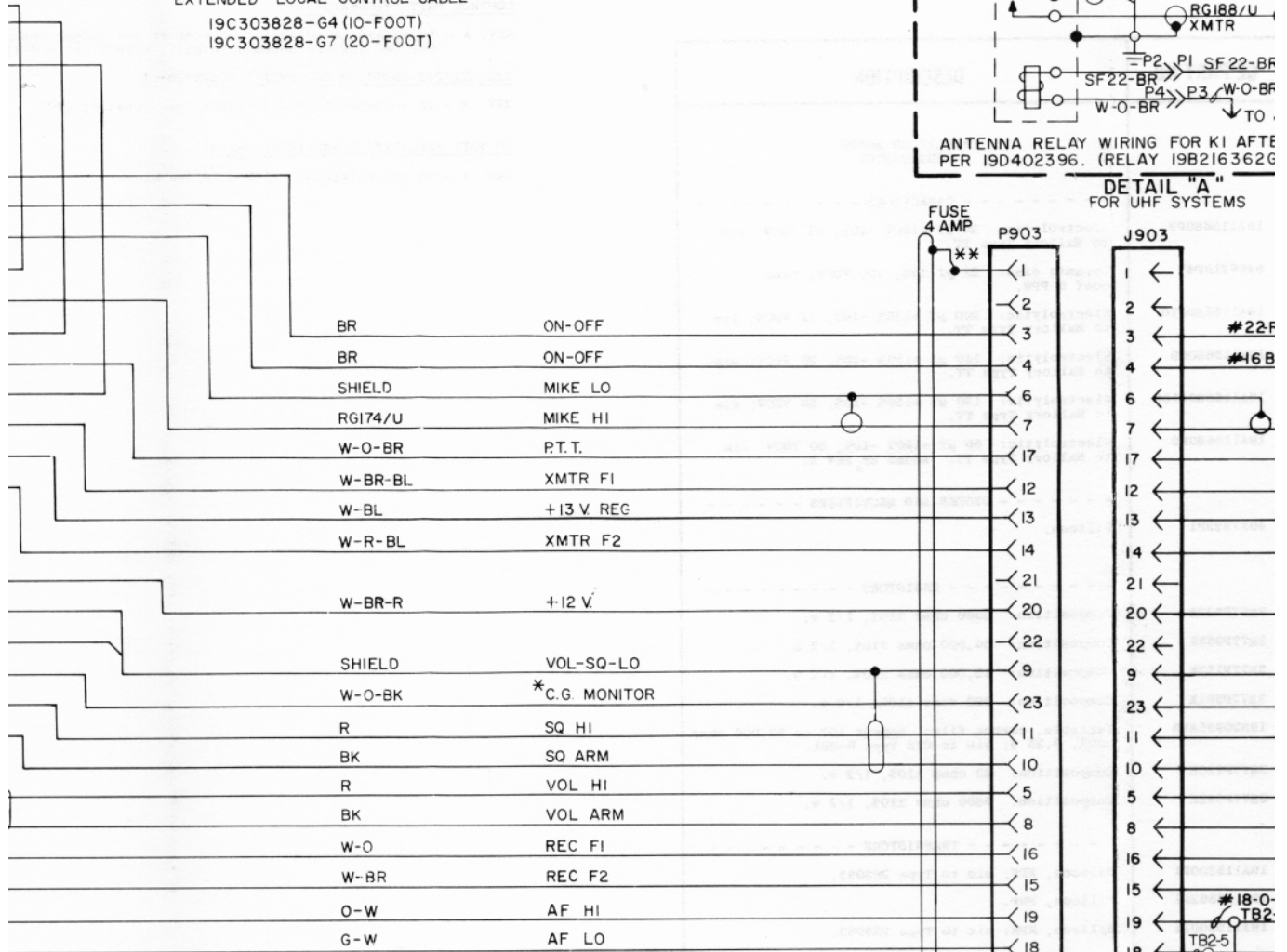
\* USED WITH  
 \* CONNECTIONS

- NOTES:  
 1. ALL WIRES ARE SF  
 2. ALL DASHED LINES  
 3. DELETE WIRES BET  
 ALSO BETWEEN TB2  
 USING 10 WATT AN  
 4. FOR 10 WATT AMPL  
 USING 24 OR 36 V  
 TO APPROPRIATE  
 5. FOR SINGLE FREQ  
 JUMPER BETWEEN  
 6. CONNECTIONS BE  
 OSCILLATOR DO  
 RECEIVERS.  
 7. P303 - UHF SYS  
 J301 - HIGH POW  
 ON HIGH POWER  
 J301 CONNECTS  
 19A12176G6.

(19C303826, Rev. 5)

# EXTENDED LOCAL CONTROL CABLE

EXTENDED LOCAL CONTROL CABLE  
 19C303828-G4 (10-FOOT)  
 19C303828-G7 (20-FOOT)



\* USED WITH CHANNEL GUARD/SEL CALL RECEIVERS  
 \*\* CONNECTIONS NOT USED ON 20-FOOT CABLE

NOTES:

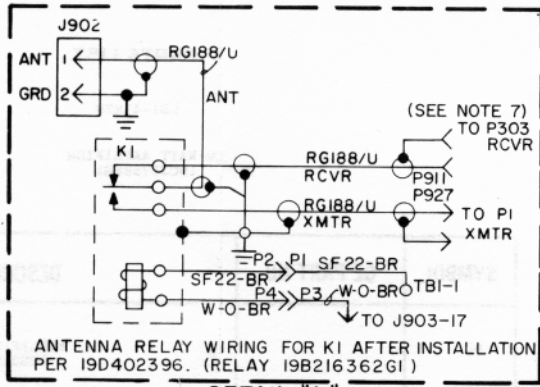
- ALL WIRES ARE SF24 EXCEPT AS NOTED.
- ALL DASHED LINES ARE OPTION.
- DELETE WIRES BETWEEN TB2-1 & TB3-3, ALSO BETWEEN TB2-5 & TB3-2, WHEN USING 10 WATT AMPLIFIER.
- FOR 10 WATT AMPLIFIER OPTION WHEN USING 24 OR 36 VOLTS CHANGE P1 & P2 TO APPROPRIATE JACK.
- FOR SINGLE FREQUENCY UNITS REMOVE JUMPER BETWEEN J1 & J9 ON TRANSMITTER.
- CONNECTIONS BETWEEN RECEIVER AND OSCILLATOR DO NOT EXIST ON UHF RECEIVERS.
- P303 - UHF SYSTEMS  
 J301 - HIGH POWER HIGH BAND SYSTEMS  
 ON HIGH POWER HIGH BAND SYSTEMS J301 CONNECTS TO P911 WITH CABLE 19A12117666.

RC-1366B

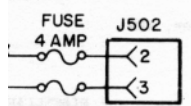
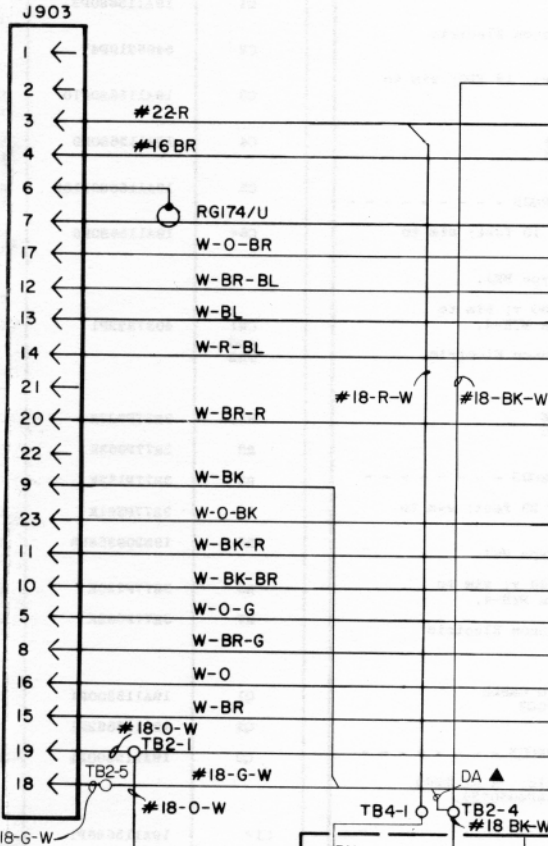
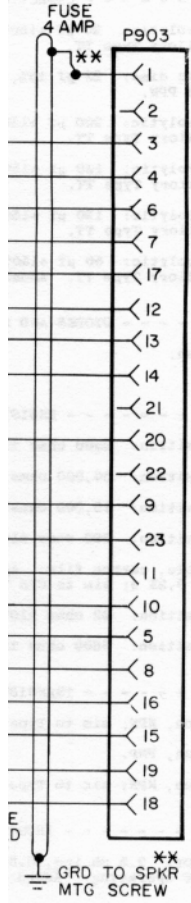
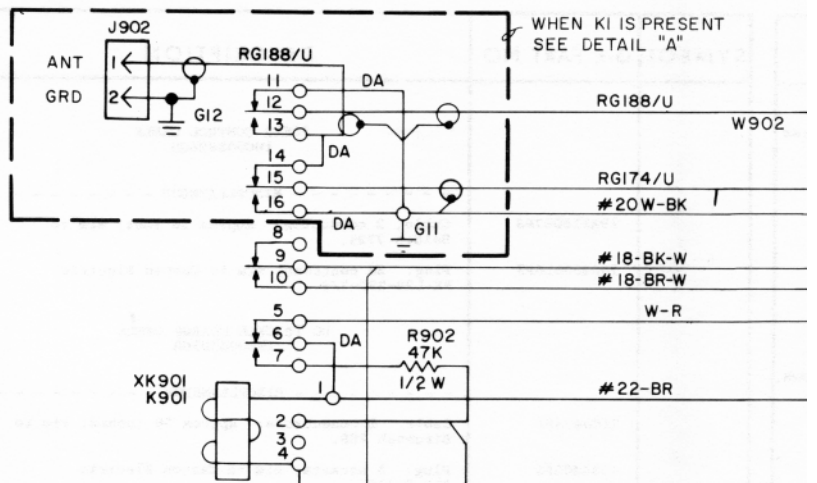
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ONE OR TWO FREQ.

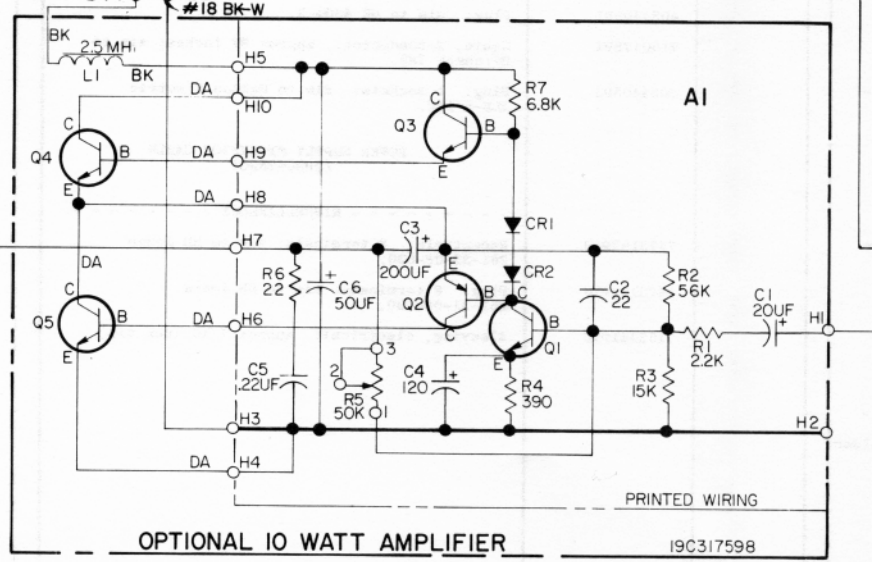
WIRE DRESS CRITICAL



DETAIL "A" FOR UHF SYSTEMS



TESTED EQUIPMENT  
 IF ANY  
 EQUIPMENT IS MADE ONLY WITH  
 THESE SPECIFICATIONS  
 SEE THE PART LIST FOR THAT PART.









## STEP 1—QUICK CHECKS

SYMPTOM	PROCEDURE
Before making any other checks, measure for approximately 24 VDC on heat sink of Q6, and 35 volts with rechargeable battery supply and 24 volts with dry battery supply on collector of Q1 in PA Assembly and orange glow on RT5.	
A. NO OSCILLATOR OUTPUT, BULB RT5 AT FULL BRIGHTNESS	Check for short on 13.5-volt line.
	Check for defective regulator transistor Q7.
B. NO OSCILLATOR OUTPUT, BULB RT5 OUT	Check bulb RT5 and Zener diode CR4.
C. NO OSCILLATOR OUTPUT, BULB RT5 NORMAL	Check two-frequency switch.
NO MODULATION	Check for approximately 6.5 VDC at collector of Q10. If the reading is either 0 volts or 13 volts, change audio transistors.
	Check connection of mic shielded lead to board.
	Check setting of MOD ADJ R31 (Refer to Transmitter Alignment Procedure).
LOW POWER OUTPUT	Check adjustment of FL1/FL3-C1 and -C2 (Refer to Transmitter Alignment Procedure).
ERRATIC TUNING OF DRIVER Q6 OUTPUT	Check capacitors C44 and C27.
LOW POWER OUTPUT	Check screws holding center place of heat sink on Q6 to be sure they are tight.
NO POWER OUTPUT. VERY LOW READING ON AMPL-1. MULT-3 READING NORMAL OR HIGH.	If reading at emitter of Q5 (J11-4) is very low, and reading at emitter of Q4 (J11-3) is normal or high, replace Q5.

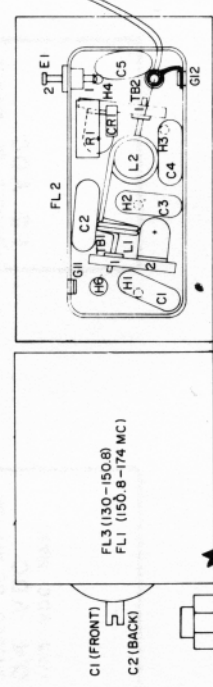
ALL READINGS ARE TYPICAL READINGS MEASURED FROM TRANSISTOR PINS TO J11-3 (GND), WITH A 20,000-OHM-PER-VOLTMETER AND THE TRANSMITTER UNKEYED. READINGS OVER 1,000 OHMS READ ON THE X1,000 SCALE OF METER +OR - SIGN SHOWS METER PROBE GROUNDED.

TRANSISTOR	EMITTER		BASE		COLLECTOR	
	+	-	+	-	+	-
EXCITER BOARD						
Q1	0	0	45 Ω	3K	6.1K	6.1K
Q2	130 Ω	105 Ω	250 Ω	3.5K	4K	1.9K
Q3	195 Ω	100 Ω	78 Ω	84 Ω	4.4K	1.9K
Q4	195 Ω	49 Ω	0	0	4.3K	2K
Q5	6.8 Ω	7 Ω	0	0	4K	1.65K
Q6	1.5 Ω	1.5 Ω	0	0	4K	1.7K
Q7	2.1K	2.1K	4.7K	13K	4.7K	1.85K
Q8	580 Ω	470 Ω	340 Ω	11.4K	2.7K	8.2K
Q9	0	0	450 Ω	8.5K	2.65K	12.5K
Q10	0	0	450 Ω	12.2K	13K	13K
Q11	0	0	460 Ω	0.9K	4.1K	1.75K
PA MULT						
Q1	0	0	0	0	∞	1.95K

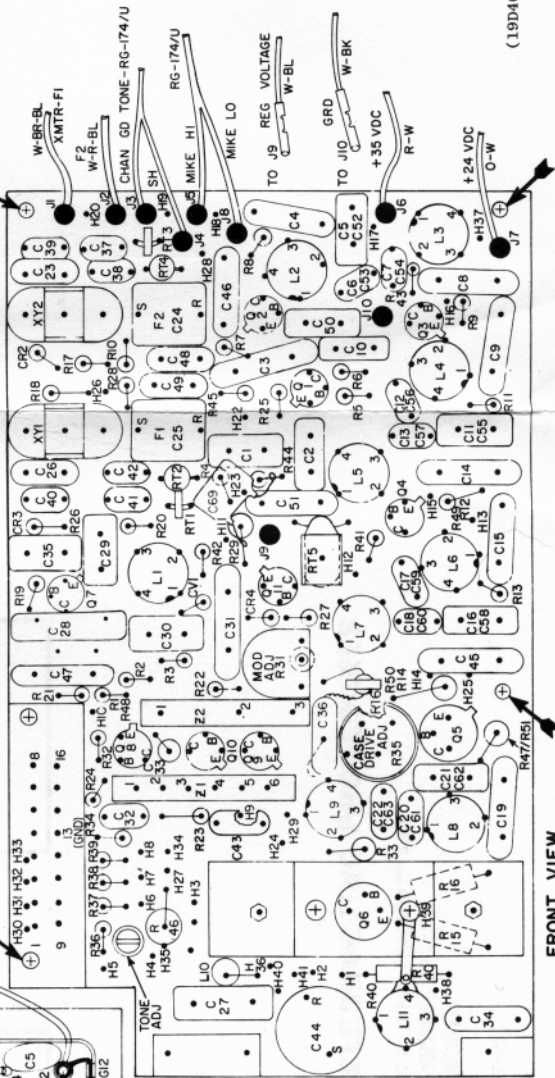
EQUIPMENT REQUIRED  
 ● 20,000 OHM-PER-VOLT DC METER

TO REMOVE XMTR REMOVE  
 SCREWS SHOWN BY ARROWS  
 AND DISCONNECT PL.

PA/MULT ASSEMBLY



EXCITER BOARD



FRONT VIEW

(19D402512, Rev. 6)

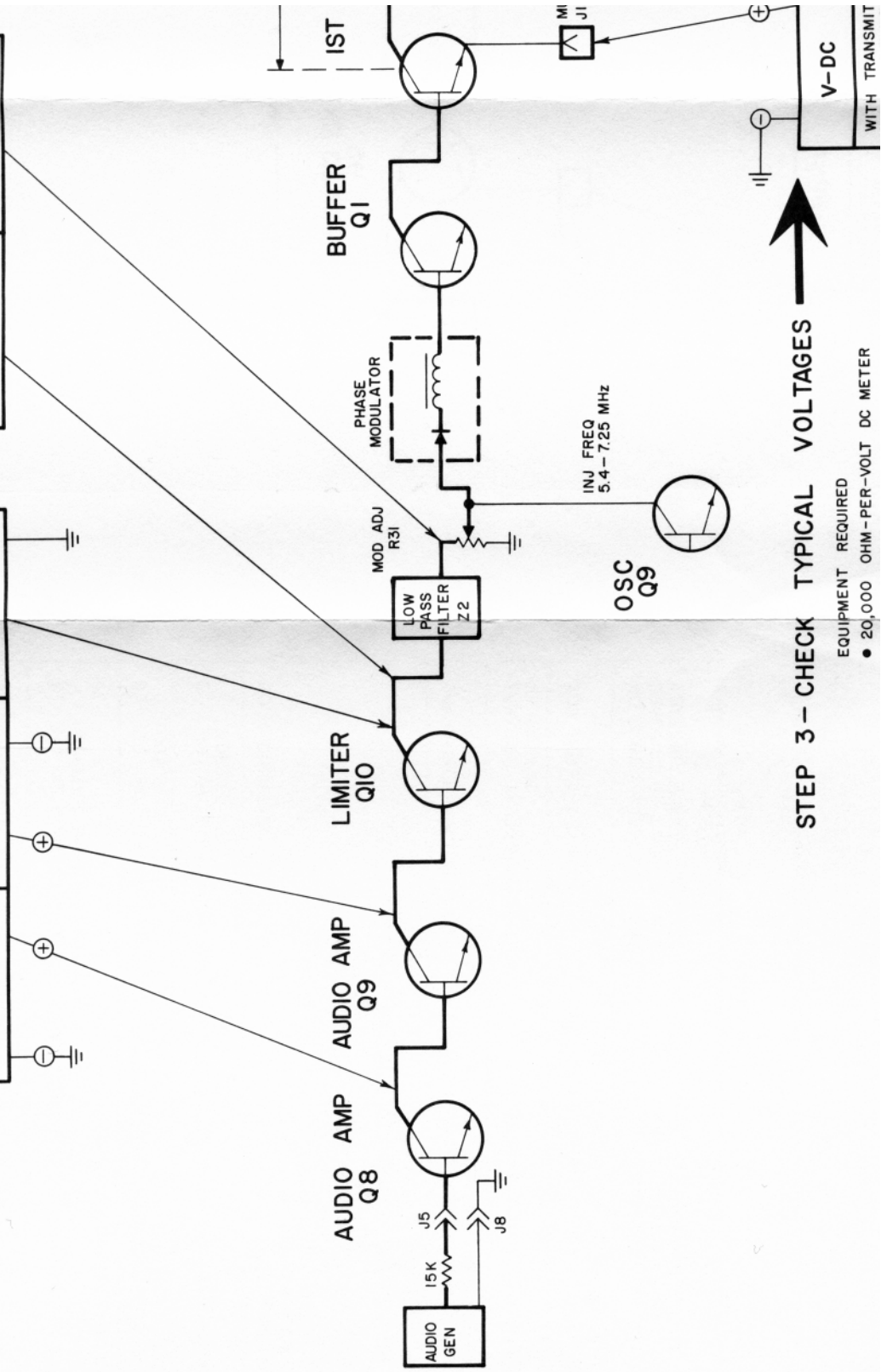
## STEP 2—CHECK AUDIO STAGES

EQUIPMENT REQUIRED

- HIGH IMPEDANCE AC-DC-VTVM
- AUDIO GENERATOR
- 15,000 Ω RESISTOR (SHOWN BELOW)

V-DC	V-DC	V-DC
WITH THE TRANS-MITTER KEYED, READING AT COLLECTOR OF Q8 SHOULD BE APPROX 0.7 VDC	WITH THE TRANS-MITTER KEYED, READING AT COLLECTOR OF Q9 SHOULD BE APPROX 0.7 VDC	WITH THE TRANS-MITTER KEYED, READING AT COLLECTOR OF Q10 SHOULD BE 6.5 VDC

AC-VTVM	AC-VTVM
ADJUST AUDIO GENERATOR FOR AN OUTPUT OF 400 MILLIVOLTS AT 1KHZ	ADJUST AUDIO GENERATOR FOR AN OUTPUT OF 400 MILLIVOLTS AT 1KHZ
WITH THE TRANS-MITTER KEYED, READING AT COLLECTOR OF Q10 SHOULD BE APPROX 4 VAC	WITH THE TRANS-MITTER KEYED, READING AT MOD ADJUST (R31) SHOULD BE APPROX 2.1 VAC



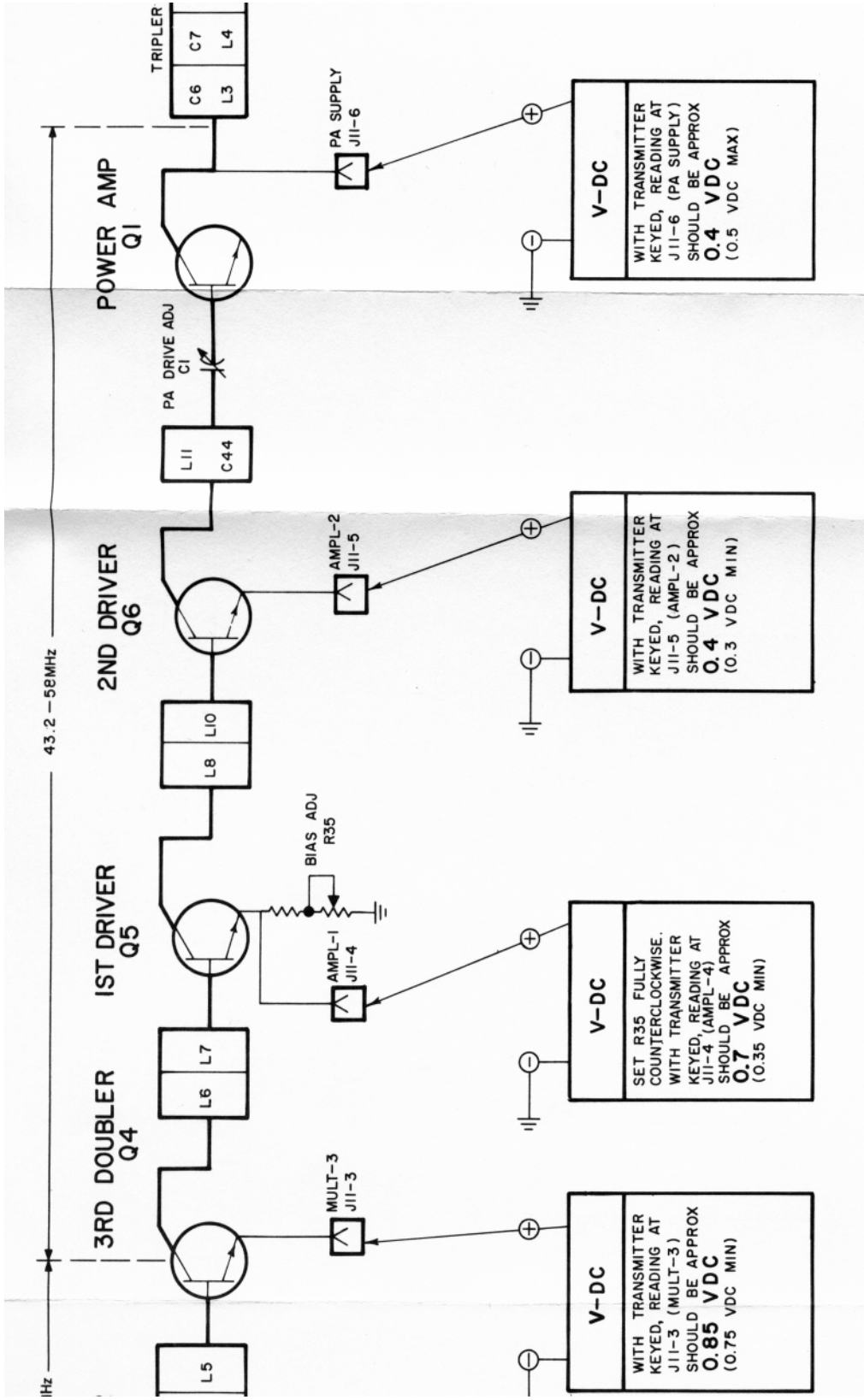
## STEP 3—CHECK TYPICAL VOLTAGES

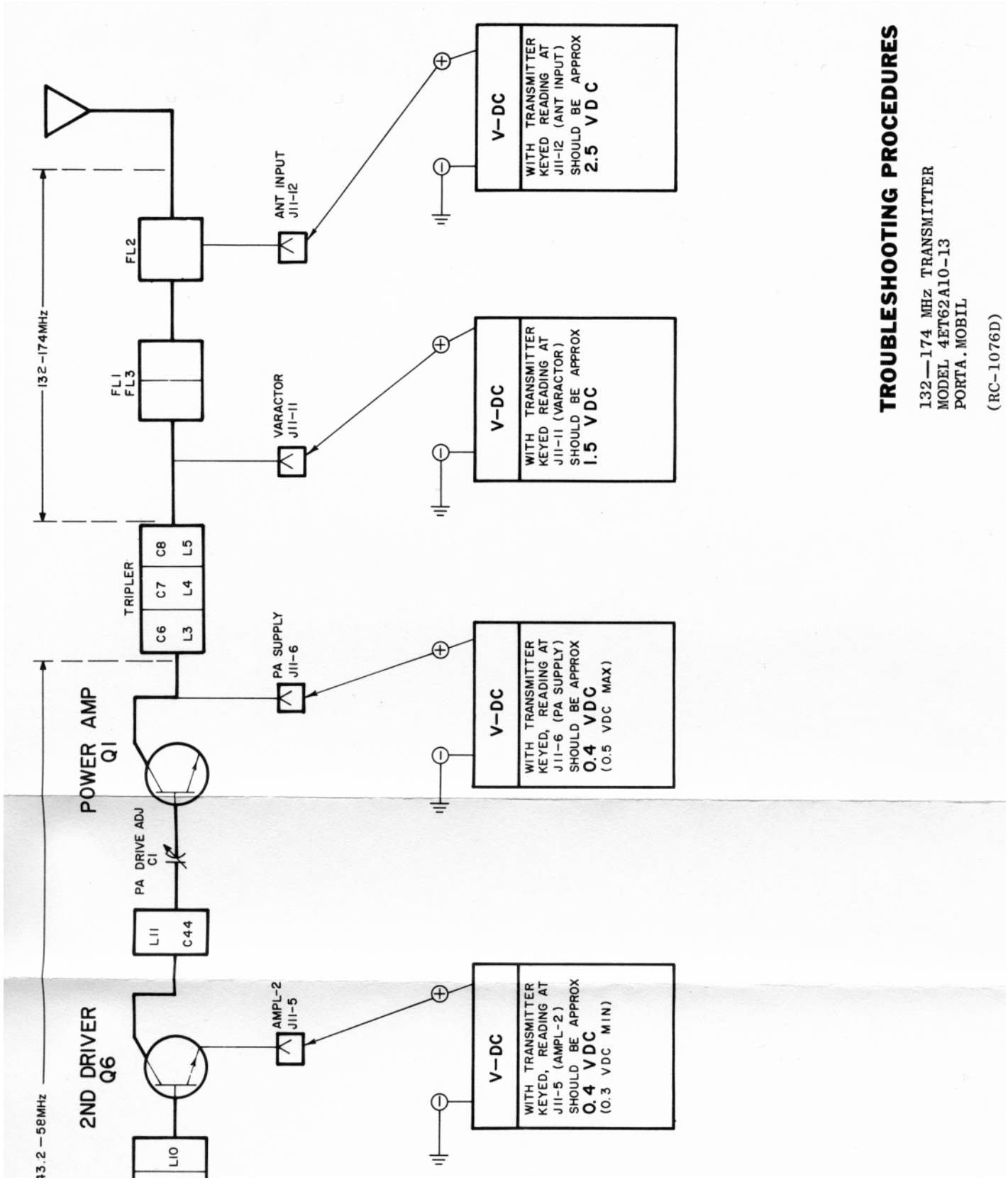
EQUIPMENT REQUIRED

- 20,000 OHM-PER-VOLT DC METER









### TROUBLESHOOTING PROCEDURES

132-174 MHz TRANSMITTER  
 MODEL 4ET62A10-13  
 PORTA. MOBIL  
 (RC-1076D)

SYMPTOM	PROCEDURE
NO SUPPLY VOLTAGE	<p>Check power connections and continuity of supply leads, and check fuse in power supply. If fuse is blown, check receiver for short circuits.</p> <p>Make resistance reading of 12-volt supply. Reading from J302 to ground (with power supply lead disconnected) should be 5.5 K ohms with negative meter probe to ground, or 4 K ohms with positive meter lead to ground.</p>
NO REGULATED 10 VOLTS	<p>Check the 12-volt supply. Then check regulator Q315 and regulator circuit.</p> <p>Resistance reading of 10-volt supply from the emitter of Q315 to ground should be 2 K ohms.</p>
LOW 2ND LIM READING	<p>Check supply voltages and then check oscillator reading at J312-4 as shown in STEP 2A.</p> <p>Make SIMPLIFIED VTVM GAIN CHECKS from 2nd Mixer through 2nd Limiter stages as shown in STEP 2A.</p>
LOW OSCILLATOR READING	<p>Check alignment of Oscillator (Refer to Front End Alignment Procedure).</p> <p>Check voltage and resistance reading of Oscillator Q425.</p> <p>Check crystal Y425. (substitution method)</p>
LOW RECEIVER SENSITIVITY	<p>Check Front End Alignment (Refer to Receiver Alignment Procedure).</p> <p>Check antenna connections, cable and relay.</p> <p>Check voltage and resistance readings of RF Amp and 1st and 2nd Mixers.</p> <p>Make SIMPLIFIED GAIN CHECKS (STEP 2A).</p>
LOW AUDIO	<p>Check Audio PA (Q701) output current at J312-9. If reading is low--</p> <ol style="list-style-type: none"> <li>Check BIAS ADJ for 0.25 VDC at J312-9 (STEP 2A).</li> <li>Check Q701.</li> </ol> <p>Make SIMPLIFIED GAIN and WAVEFORM CHECKS (STEPS 2A and 2B) of Audio and Squelch stages.</p> <p>Check unquelled voltage readings in Audio section (Refer to Receiver Service Sheet).</p> <p>Check voltage and resistance readings on Channel Guard receiver.</p>
IMPROPER SQUELCH OPERATION	<p>Make GAIN and WAVEFORM CHECKS (STEPS 2A and 2B) of Audio and Squelch stages.</p> <p>Check voltage and resistance readings of Squelch circuit (Refer to Receiver Service Sheet).</p>
DISCRIMINATOR IDLING TOO FAR OFF ZERO	<p>See if discriminator zero is in the center of IF bandpass.</p>

RESISTANCE READINGS  
RESISTANCE READINGS ARE TYPICAL READINGS  
MEASURED TO J312-13 (GROUND), AND WITH  
ALL POWER REMOVED FROM THE CHASSIS.

MEASURED FROM	NEGATIVE (-) PROBE TO GND	POSITIVE (+) PROBE TO GND
* J302	5.5K	4K
J305	11K	1.8K
J312-2	1 MEG OHM	60K
J312-3	1 MEG OHM	60K
J312-4	2 MEG OHMS	6.8K
J312-9	1 Ω (HI) 8 Ω (LO)	1 Ω (HI) 8 Ω (LO)
J312-10	150K	150K

\* MEASURED WITH POWER SUPPLY LEAD  
P712 (+ 12V) DISCONNECTED.





### STEP 3- GAIN-PER-STAGE READINGS-

#### EQUIPMENT REQUIRED:

1. RF VOLTMETER (SIMILAR TO BOONTON MODEL 91-CA OR MILLIVAC TYPE MW-1B C.
2. SIGNAL ON RECEIVER FREQUENCY (BELOW SATURATION) CORRECT FREQUENCY CAN BE DETERMINED BY ZEROING THE DISCRIMINATOR.

#### PROCEDURE

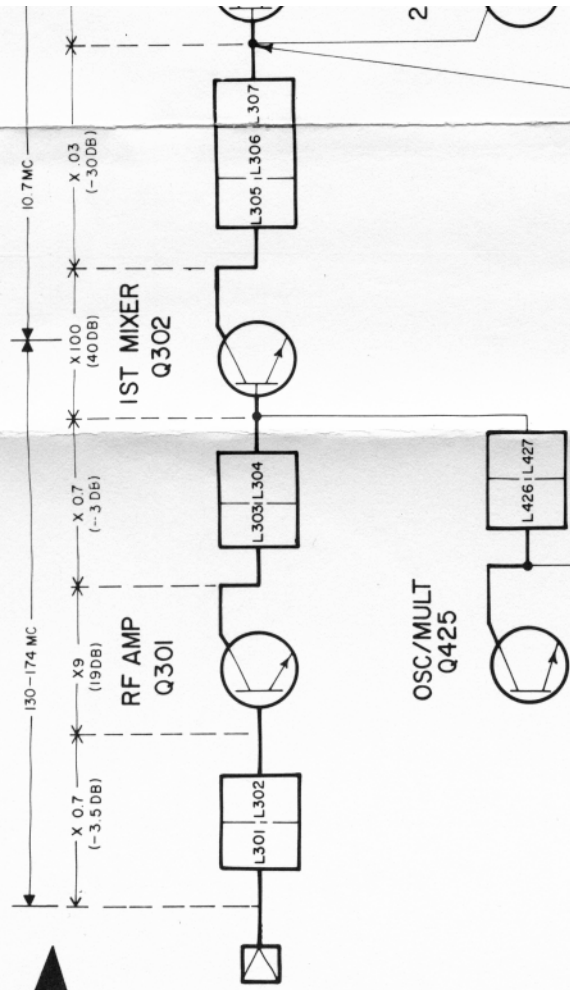
1. APPLY PROBE TO INPUT OF STAGE (FOR EXAMPLE, BASE OF RF AMP). PEAK RESONANT CIRCUIT OF STAGE BEING MEASURED AND TAKE VOLTAGE READING ( $E_1$ ).
2. MOVE PROBE TO INPUT OF FOLLOWING STAGE (1ST-MIXER). REPEAT FIRST RESONANT CIRCUIT THEN PEAK CIRCUIT BEING MEASURED AND TAKE READING ( $E_2$ ).
3. CONVERT READINGS (BY SUBTRACTING  $E_1$  FROM  $E_2$  ON THE DB SCALE OF RF VOLTMETER, OR) BY MEANS OF THE FOLLOWING FORMULA.

$$\text{AMP FACTOR} = \frac{E_2}{E_1}$$

4. CHECK RESULTS WITH TYPICAL GAINS SHOWN ON DIAGRAM BELOW.

5. USE PROCEDURE LISTED ABOVE TO FIND GAIN OF EACH STAGE.

\* NOTE: REMOVE CRYSTAL OR SHORT OUT OSC. BASE BEFORE MEASURING MIXER STAGES TO ELIMINATE INJECTION VOLTAGE.



### STEP 2A- SIMPLIFIED VTVM GAIN CHECKS

#### EQUIPMENT REQUIRED:

1. VTVM-AC4DC
2. SIGNAL GENERATOR (MEASUREMENTS M560 EQUIV.)

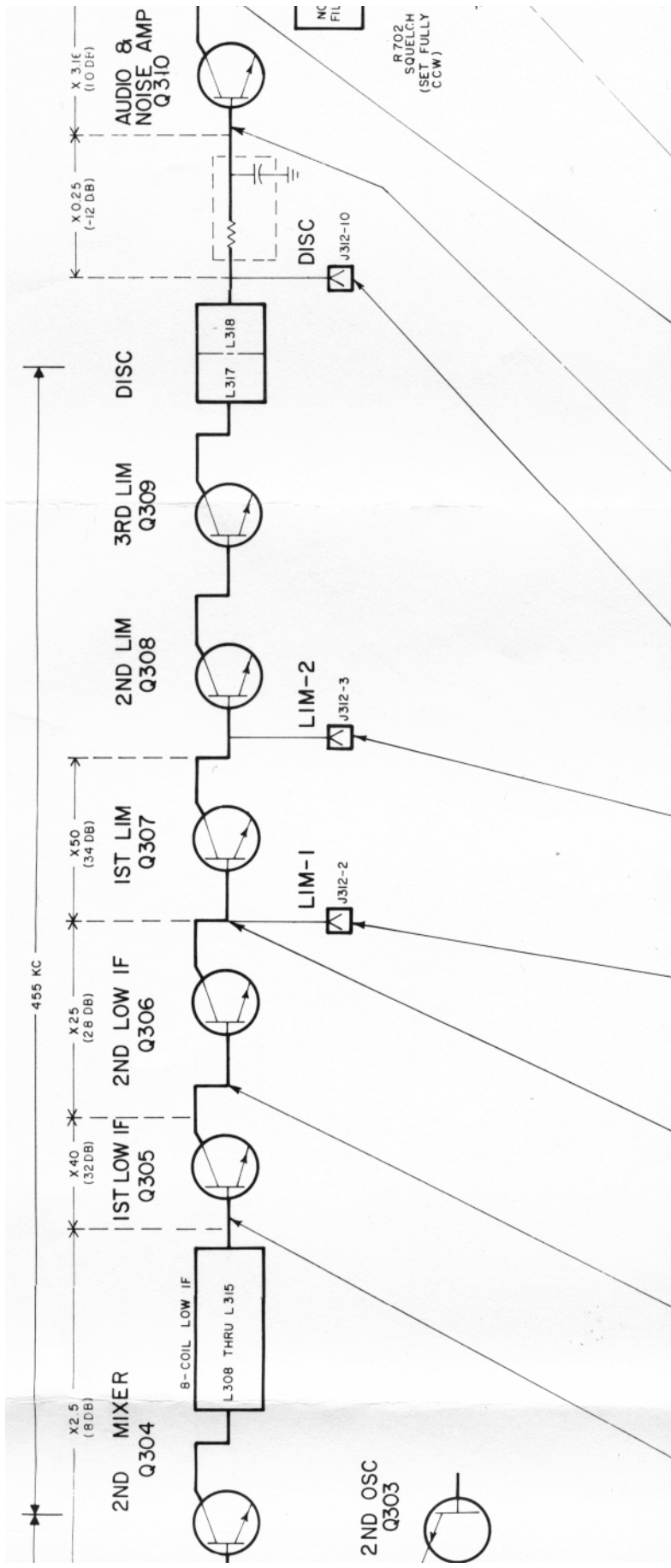
#### PRELIMINARY STEPS:

1. SET VOLUME CONTROL FULLY CLOCKWISE.
2. SET SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
3. RECEIVER SHOULD BE PROPERLY ALIGNED.

SIGNAL GENERATOR INPUT SETTINGS AT DISCRIMINATOR ZERO	UNMODULATED
PROCEDURE	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING INCREASES BY 10%
READING	GENERATOR OUTPUT SHOULD BE APPROX 6 MILLIVOLTS

### STEP 2B-AUDIO

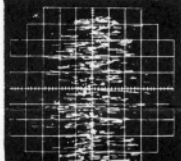
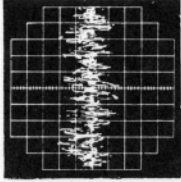
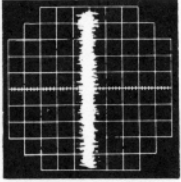
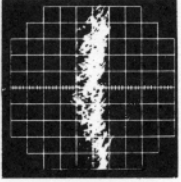
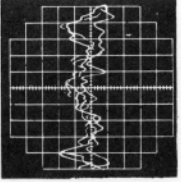

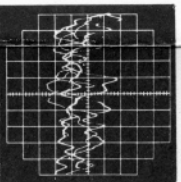
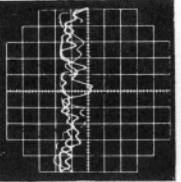
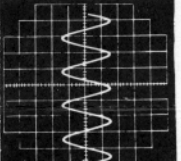
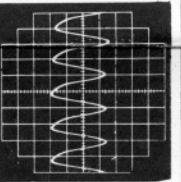
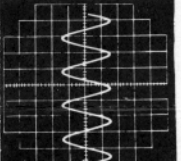
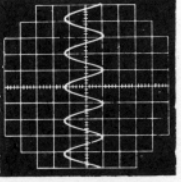

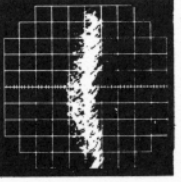
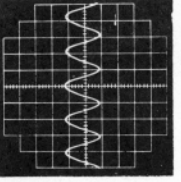

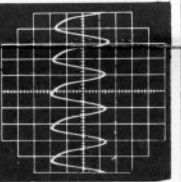
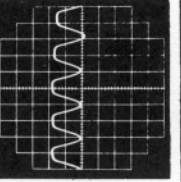


EQUIPME



UNMODULATED	UNMODULATED	UNMODULATED	100 MICROVOLTS UNMODULATED	1 MICROVOLT UNMODULATED	STANDARD SIGNAL- (1 MILLIVOLT AT RCVR FREQ. MODULATED BY 1KC WITH 3.3KC DEVIATION)	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD
INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5%	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5%	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5%	1.5 VDC EX-3-A 0.35 VDC MULTMTR 0.75 VDC	1.1 VDC EX-3-A 0.44 VDC MULTMTR 0.9 VDC	0.50 VAC	0.1 VAC	0.70 VAC	0.06 VAC	1 VAC
GENERATOR OUTPUT SHOULD BE APPROX 700 MICROVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 600 MICROVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 10 MICROVOLTS							





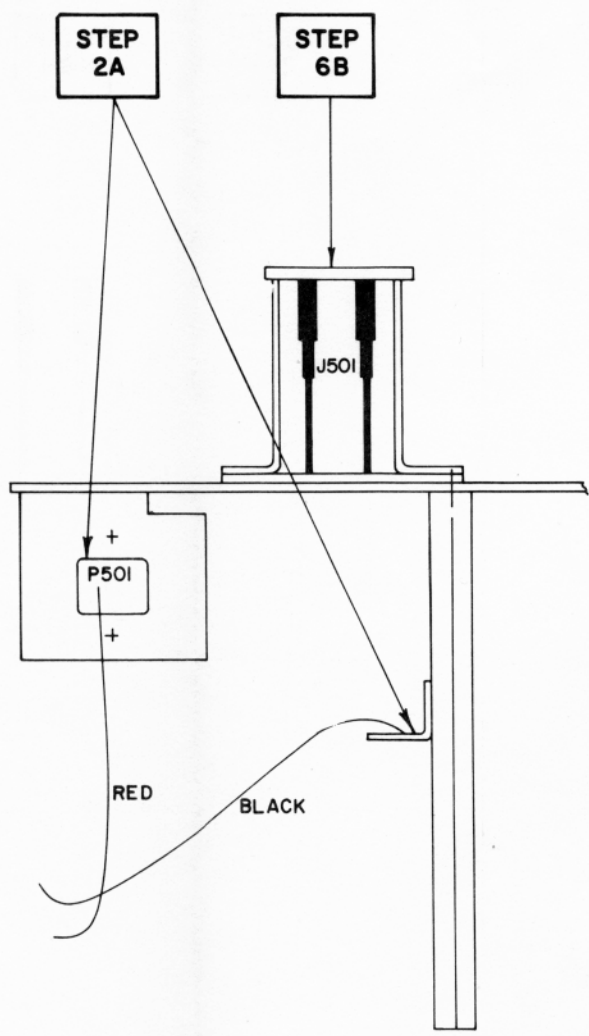
STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	NO SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL
0.1 VAC	0.70 VAC	0.06 VAC	1 VAC	.085 VAC	0.8 VDC	1.2 VAC	0.7 VAC		
0.5 MS/DIV 100 MILLIVOLTS/DIV 0.3 V P-P	0.5 MS/DIV 1 VOLT/DIV 2.1 V P-P	0.5 MS/DIV 100 MILLIVOLTS/DIV 0.4 V P-P	2 MS/DIV (500CPS) 1 VOLT/DIV 2.5 V P-P	0.5 MS/DIV 100 MILLIVOLTS/DIV 0.24 V P-P	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV
									
									



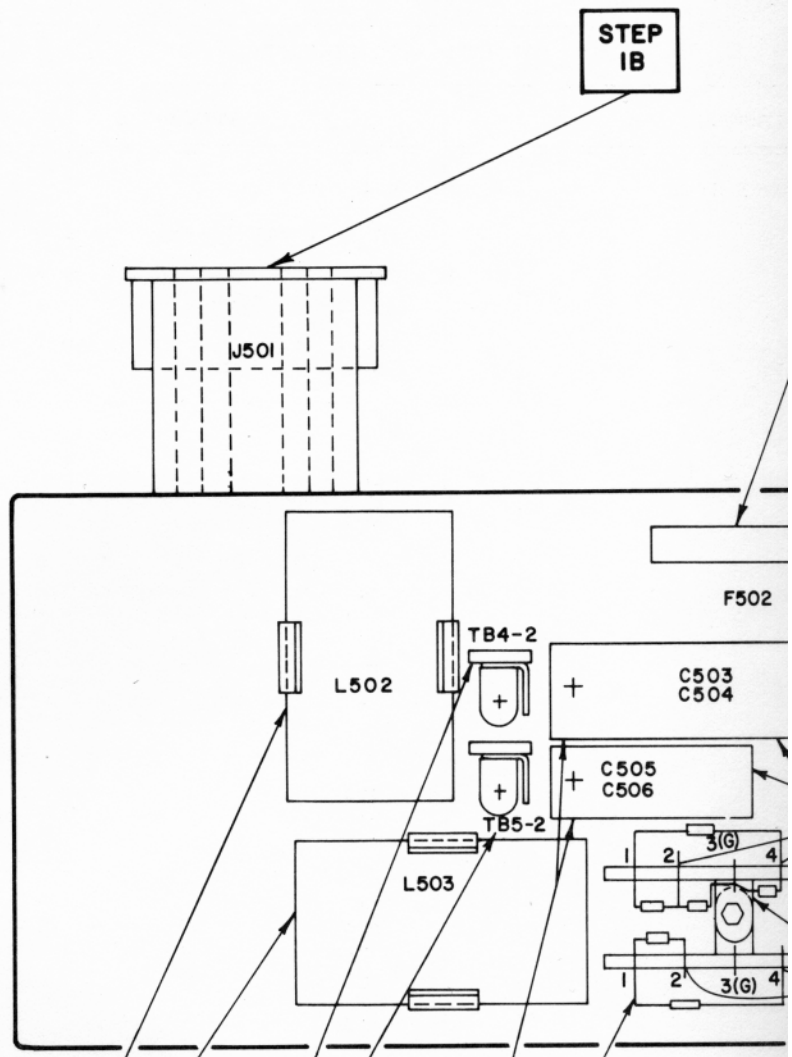


## QUICK CHECKS

MULTIVIBRATOR CIRCUIT	
SYMPTOM	PROCEDURE
POWER SUPPLY WON'T START	<ol style="list-style-type: none"> <li>1. Check the following:                             <ol style="list-style-type: none"> <li>A. F502 (5 amps) fuse. If fuse is blown--</li> <li>B. Check for short in wiring to J501-4 and J501-5 to ground.</li> <li>C. Check for collector-to-emitter short in Q501 and Q502.</li> </ol> </li> </ol> <hr/> <ol style="list-style-type: none"> <li>2. Check the following voltages:                             <ol style="list-style-type: none"> <li>A. Supply voltage (12 VDC) by measuring from P501 (red lead) to ground (black lead). Do not key transmitter.</li> <li>B. Measure collector-to-emitter voltage of transistors with transmitter keyed. Readings should be approximately equal to supply voltage.</li> </ol> </li> </ol> <hr/> <ol style="list-style-type: none"> <li>3. Check starting network R501 and DS1 for opens or shorts.</li> </ol> <hr/> <ol style="list-style-type: none"> <li>4. Make continuity check of primary and feedback circuits (see Power Supply Service Sheet).</li> </ol> <hr/> <ol style="list-style-type: none"> <li>5. Check for shorted turns or shorts between windings of T501. To check, disconnect all secondary windings of T501 from their loads. Next, key the transmitter. If unit starts, go to STEP 6. If unit does not start, T501 is probably defective.</li> </ol> <hr/> <ol style="list-style-type: none"> <li>6. Check for excessive load in secondary.                             <ol style="list-style-type: none"> <li>A. Check for shorted capacitors or diodes.</li> <li>B. Check connections from J501 to transmitter board (see Control Unit Service Sheet).</li> </ol> </li> </ol>
OUTPUT VOLTAGES BELOW NORMAL WITH SUPPLY VOLTAGE NORMAL	<ol style="list-style-type: none"> <li>7. Check for excessive load.                             <ol style="list-style-type: none"> <li>A. Check for shorts or opens in diodes and capacitors in secondary of T501.</li> <li>B. Normal Load:                                     <ol style="list-style-type: none"> <li>(1) ET-61-A, ET-62-A &amp; ET-88-A -- Normal load on high B+ is approximately 800 milliamps (TB4-2). Normal load on low B+ is approximately 300 milliamps (TB5-2).</li> <li>(2) ET-77-A &amp; ET-78-A -- Normal load on B+ is approximately 360 milliamps (TB5-2).</li> </ol> </li> <li>C. Check continuity L502 and L503.</li> </ol> </li> </ol>
HIGH VOLTAGE (37 v) MUCH LOWER THAN NORMAL, AND LOW VOLTAGE (24 v) NEGATIVE WITH RESPECT TO GROUND.	<ol style="list-style-type: none"> <li>8. Check for open ground to diode bridge (TB6-3), and check ground connections to TB6-3.</li> </ol>



END VIEW

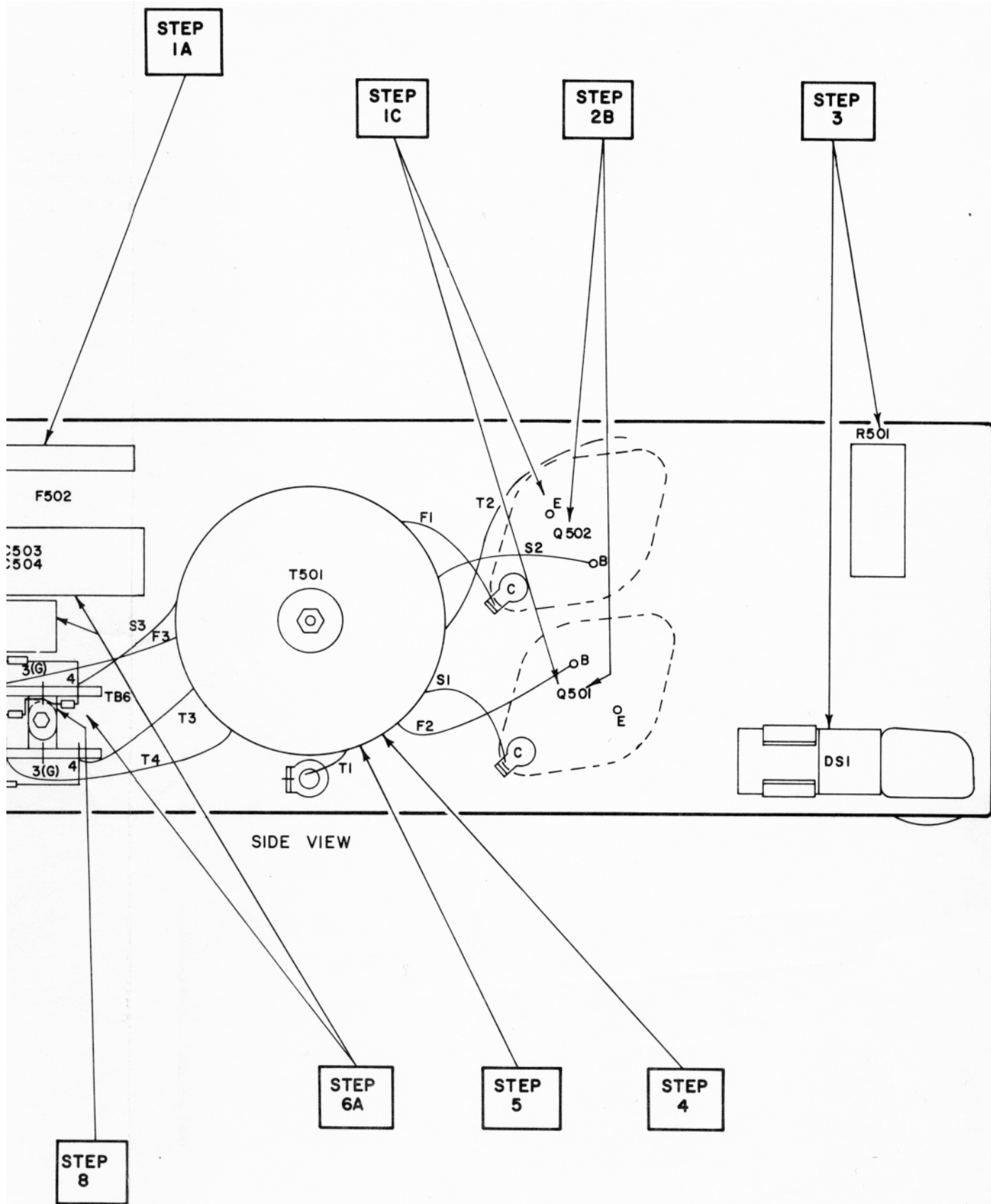


STEP 7C

STEP 7B

STEP 7A

ST



## TROUBLESHOOTING PROCEDURE

RECHARGEABLE POWER SUPPLY  
 MODEL 4EP44A10, A11, & 4EP65A10  
 PORTA.MOBIL

(RC-1078D)

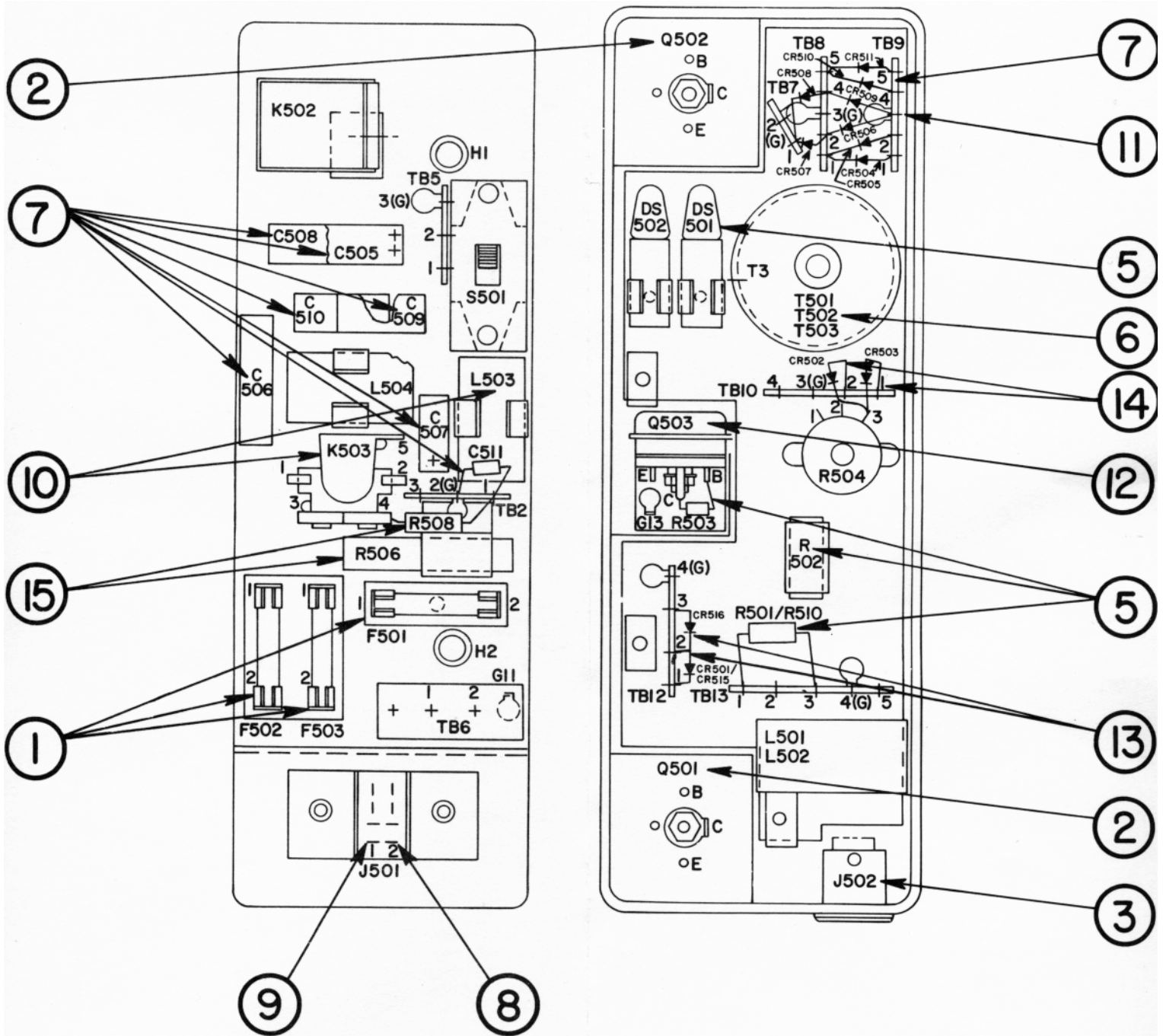
## QUICK CHECKS

MULTIVIBRATOR CIRCUIT	
SYMPTOM	CHECK THE FOLLOWING: (Circled number refers to component location on diagram)
Power Supply does not start	All fuses ①
	Q501 and Q502 for collector-to-emitter short ②
	Input voltage to power supply, J502-1-2 (J502-1-3 on 4EP48A10) ③
	Transistor collector-to-emitter voltage. Readings should be approximately equal to supply voltage ②
	R501/R510, R502, R503, and DS501 for opens or shorts ⑤
	Continuity of transformer primary and secondaries. (See Power Supply Service Sheet) ⑥
	Transformer for shorted turns or shorts between windings (disconnect loads from secondary windings before checking) ⑥
	Turn unit ON, if unit does not start, transformer is probably defective ⑥
	If unit starts, check the following:
	Excessive load in secondary
	Shorted capacitors or diodes in secondary of transformer ⑦
Connections from J502 to transformer board (see Service Sheet) ③	
Output voltages below normal with input supply voltage normal	Shorts or opens in diodes and capacitors in transformer secondary ⑦
	Normal high B+ load: (ET-61-A, ET-62-A and ET-88-A) 4EP47A10-11 - 32 volts @ 1 amp at J501-2 ⑧ 4EP48A10 - 32 volts @ 800 mA at J501-2 ⑧
	Normal low B+ load: (ET-61-A, ET-62-A and ET-88-A) 4EP47A10-11 - 24 volts @ 0.5 amp at J501-1 ⑨ 4EP48A10 - 24 volts @ 330 mA at J501-1 ⑨
	Normal B+ load (ET-77-A and ET-78-A) 4EP47A10-11 & 4EP48A10 24 volts @ 360 mA at J501-1 ⑨
	Continuity of K503 winding and L503 ⑩
High voltage (32 v) much lower than normal, and low voltage (24 v) negative with respect to ground	TB9-3 for open ground to diode bridge and other wires connected to ground at TB9-3 ⑪
Output voltages below normal	DS501/R503 for open circuit ⑤
	Q503 for open collector-emitter circuit ⑫
	CR501/CR515 and CR516 for shorts ⑬
	CR502 and CR503 for open ⑭
Output voltages above normal	DS501/R503 for shorts ⑤
	Q503 for collector-emitter short ⑫
	CR501/CR515 and CR516 for open ⑬
	CR502 and CR503 for open and short ⑭
	R506 and R508 for open and short ⑮

NOTE -- 4EP47A10 and 4EP48A10

If K502 chatters when transmitter is keyed, check for a short to ground in one of the B+ circuits.





## TROUBLESHOOTING PROCEDURE

POWER SUPPLY  
 MODELS 4EP47A10, 11 & 4EP48A10

(RC-1237B)